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For related information see also *Astronautics*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

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84 LAW AND POLITICAL SCIENCE **N.A.**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **3215**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **3215**

89 ASTRONOMY **3216**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **3218**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **3219**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **3221**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **3221**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **3222**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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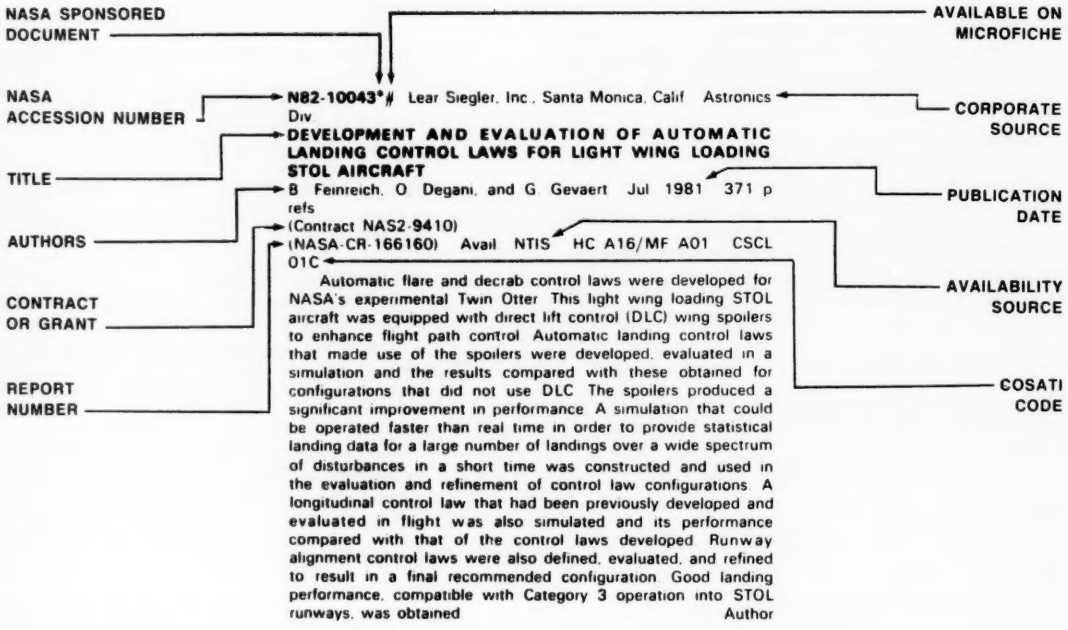
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div
CORPORATE SOURCE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
TITLE
PUBLICATION DATE
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
AUTHORS
(Contract NAS2-9410)
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
AVAILABILITY SOURCE
CONTRACT OR GRANT
REPORT NUMBER
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 22/NOVEMBER 23, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-31293* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jul. 1982 114 p
(NASA-SP-7037(150); NAS 1.21:7037(150)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 382 reports, articles and other documents introduced into the NASA scientific and technical information system in June 1982. Author

N82-31294*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE AND ECONOMIC CHARACTERISTICS OF AN ADVANCED BLENDED SUPERSONIC TRANSPORT CONCEPT
John K. Molloy, William D. Grantham, and Milton J. Neubauer, Jr. Sep. 1982 32 p refs
(NASA-TP-2073; L-15297; NAS 1.60:2073) Avail: NTIS HC A03/MF A01 CSCL 01B

Noise and economic characteristics were obtained for an advanced supersonic transport concept that utilized wing body blending, a double bypass variable cycle engine, superplastically formed and diffusion bonded titanium in both the primary and secondary structures, and an alternative interior arrangement that provides increased seating capacity. The configuration has a cruise Mach number of 2.62, provisions for 290 passengers, a mission range of 8.19 Mm (4423 n.mi.), and an average operating cruise lift drag ratio of 9.23. Advanced operating procedures, which have the potential to reduce airport community noise, were explored by using a simulator. Traded jet noise levels of 105.7 and 103.4 EPNdB were obtained by using standard and advanced takeoff operational procedures, respectively. A new method for predicting lateral attenuation was utilized in obtaining these jet noise levels. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-31295*# United Technologies Research Center, East Hartford, Conn.
A DOUBLET LATTICE METHOD FOR THE DETERMINATION OF ROTOR INDUCED EMPENNAGE VIBRATION AIRLOADS. ANALYSIS DESCRIPTION AND PROGRAM DOCUMENTATION
Santu T. Gangwani Jun. 1982 68 p refs
(Contract NAS1-16058)
(NASA-CR-165893; NAS 1.26:165893; UTRC81-7) Avail: NTIS HC A05/MF A01 CSCL 01A

An efficient state-of-the-art method was developed to determine the unsteady vibratory airloads produced by the interaction of the main rotor wake with a helicopter empennage. This method was incorporated into a computer program, Rotor Induced Empennage Vibration Analysis (RIEVA). The program requires the main rotor wake position and the strength of the vortices locates near the empennage surfaces. A nonlinear lifting surface analysis is utilized to predict the aerodynamic loads on the empennage surfaces in the presence of these concentrated vortices. The analysis was formulated to include all pertinent effects such as suction of the interacting vortices and the shed vorticity behind the empennage surfaces. The analysis employs a time domain solution. The output of the program consists of chordwise and spanwise airload distributions on the empennage surfaces. The airload distributions are harmonically analyzed and formulated for input into the Coupled Rotor/Airframe Vibration Analysis. Author

N82-31296*# United Technologies Research Center, East Hartford, Conn.
A PRESCRIBED WAKE ROTOR INFLOW AND FLOW FIELD PREDICTION ANALYSIS, USER'S MANUAL AND TECHNICAL APPROACH
T. A. Egolf and A. J. Landgrebe Jun. 1982 79 p refs
(Contract NAS1-16058)
(NASA-CR-165894; NAS 1.26:165894; UTRC81-2) Avail: NTIS HC A05/MF A01 CSCL 01A

A user's manual is provided which includes the technical approach for the Prescribed Wake Rotor Inflow and Flow Field Prediction Analysis. The analysis is used to provide the rotor wake induced velocities at the rotor blades for use in blade airloads and response analyses and to provide induced velocities at arbitrary field points such as at a tail surface. This analysis calculates the distribution of rotor wake induced velocities based on a prescribed wake model. Section operating conditions are prescribed from blade motion and controls determined by a separate blade response analysis. The analysis represents each blade by a segmented lifting line, and the rotor wake by discrete segmented trailing vortex filaments. Blade loading and circulation distributions are calculated based on blade element strip theory including the local induced velocity predicted by the numerical integration of the Biot-Savart Law applied to the vortex wake model. Author

N82-31297*# Sikorsky Aircraft, Stratford, Conn.
USER'S MANUAL FOR THE AUTOMATED PANELING TECHNIQUE (APT) AND THE WING BODY AERODYNAMIC TECHNIQUE (WABAT) PROGRAMS Final Report
R. E. Studwell Jun. 1982 44 p refs
(Contract NAS1-16058)
(NASA-CR-165895; NAS 1.26:165895) Avail: NTIS HC A03/MF A01 CSCL 01A

User instructions for the Tektronix Graphics Package of the Automated Paneling Technique (APT) and the Wing and Body Aerodynamic Technique (WABAT) Programs are provided. Re-

sponses to plot package messages which the user must make to activate plot package operations and options are described. Modifications to the APT and WABAT input run streams, to affect the graphic interface, are also covered. Author

N82-31298*# United Technologies Research Center, East Hartford, Conn.
AEROELASTIC ANALYSIS FOR HELICOPTER ROTORS WITH BLADE APPENDED PENDULUM VIBRATION ABSORBERS. MATHEMATICAL DERIVATIONS AND PROGRAM USER'S MANUAL Final Report
Richard L. Bielawa Jun. 1982 109 p refs
(Contract NAS1-16058)
(NASA-CR-165896; NAS 1.26:165896; UTRC81-45) Avail: NTIS HC A06/MF A01 CSCL 01A

Mathematical development is presented for the expanded capabilities of the United Technologies Research Center (UTRC) G400 Rotor Aeroelastic Analysis. This expanded analysis, G400PA, simulates the dynamics of teetered rotors, blade pendulum vibration absorbers and the higher harmonic excitations resulting from prescribed vibratory hub motions and higher harmonic blade pitch control. Formulations are also presented for calculating the rotor impedance matrix appropriate to these higher harmonic blade excitations. This impedance matrix and the associated vibratory hub loads are intended as the rotor blade characteristics elements for use in the Simplified Coupled Rotor/Fuselage Vibration Analysis (SIMVIB). Sections are included presenting updates to the development of the original G400 theory, and material appropriate to the user of the G400PA computer program. This material includes: (1) a general description of the structuring of the G400PA FORTRAN coding, (2) a detailed description of the required input data and other useful information for successfully running the program, and (3) a detailed description of the output results. Author

N82-31299*# Sikorsky Aircraft, Stratford, Conn.
USER'S MANUAL FOR THE COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS GRAPHIC PACKAGE Final Report
R. E. Studwell Jun. 1982 27 p
(Contract NAS1-16058)
(NASA-CR-165897; NAS 1.26:165897) Avail: NTIS HC A03/MF A01 CSCL 01A

User instructions for a graphics package for coupled rotor/airframe vibration analysis are presented. Responses to plot package messages which the user must make to activate plot package operations and options are described. Installation instructions required to set up the program on the CDC system are included. The plot package overlay structure and subroutines which have to be modified for the CDC system are also described. Operating instructions for CDC applications are included. S.L.

N82-31300*# Flow Research, Inc., Kent, Wash.
SINGULARITY EMBEDDING METHOD IN POTENTIAL FLOW CALCULATIONS
Wen-Huei Jou and Hung Huynh Jun. 1982 28 p refs
(NASA Order A-77471B)
(NASA-CR-166387; NAS 1.26:166387) Avail: NTIS HC A03/MF A01 CSCL 01A

The so-called H-type mesh is used in a finite-element (or finite-volume) calculation of the potential flow past an airfoil. Due to coordinate singularity at the leading edge, a special singular trial function is used for the elements neighboring the leading edge. The results using the special singular elements are compared to those using the regular elements. It is found that the unreasonable pressure distribution obtained by the latter is removed by the embedding of the singular element. Suggestions to extend the present method to transonic cases are given. Author

N82-31301*# Grumman Aerospace Corp., Bethpage, N.Y.
AXISYMMETRIC AND NON-AXISYMMETRIC EXHAUST JET INDUCED EFFECTS ON A V/STOL VEHICLE DESIGN. PART 2: ANALYSIS OF RESULTS
W. C. Schnell Jan. 1982 202 p refs
(Contract NAS2-9887)
(NASA-CR-166365; NAS 1.26:166365) Avail: NTIS HC A10/MF A01 CSCL 01A

A wind tunnel investigation, employing a 1/8 scale model in an 11 foot transonic wind tunnel (Mach 0.4-1.4), was conducted to determine the jet effects of several exhaust nozzles on the aeropropulsive performance of a V/STOL fighter design. The force and pressure data show that significant differences in aeropropulsion performance can be expected by varying the exhaust nozzle type, jet area and deflection angle on an underwing nacelle installation. At unvectored conditions, the single expansion ramp nozzles show large performance gains relative to a circular nozzle installation. Additionally, a further drag reduction is realized when the nonaxisymmetric nozzle is vectored through a 10 degree deflection angle. The combined payoff of the vectored nonaxisymmetric nozzle over the baseline circular nozzle installation is equivalent to 25 percent of zero lift drag. R.J.F.

N82-31302*# Grumman Aerospace Corp., Bethpage, N.Y.
AXISYMMETRIC AND NON-AXISYMMETRIC EXHAUST JET INDUCED EFFECTS ON A V/STOL VEHICLE DESIGN. PART 3: EXPERIMENTAL TECHNIQUE
W. C. Schnell Jun. 1982 115 p refs
(Contract NAS2-9887)
(NASA-CR-166147; NAS 1.26:166147) Avail: NTIS HC A06/MF A01 CSCL 01A

The jet induced effects of several exhaust nozzle configurations (axisymmetric, and vectoring/modulating varients) on the aeropropulsive performance of a twin engine V/STOL fighter design was determined. A 1/8 scale model was tested in an 11 ft. transonic tunnel at static conditions and over a range of Mach Numbers from 0.4 to 1.4. The experimental aspects of the static and wind-on programs are discussed. Jet effects test techniques in general, fow through balance calibrations and tare force corrections, ASME nozzle thrust and mass flow calibrations, test problems and solutions are emphasized. S.L.

N82-31303*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUPERCRITICAL MANEUVERING FIGHTER CONFIGURATION. WIND-TUNNEL INVESTIGATION AT MACH NUMBERS OF 0.60 TO 0.95
Michael J. Mann, Charles E. Mercer, and Richard L. Campbell Sep. 1982 69 p refs
(NASA-TM-84513; L-15399; NAS 1.15:84513) Avail: NTIS HC A04/MF A01 CSCL 01A

A wind tunnel investigation was conducted to study the application of supercritical technology to highly maneuverable combat aircraft. The configuration studied has a leading-edge sweep of 45 deg and an aspect ratio of 3.28. Two supercritical-wing shapes were tested at Mach numbers from 0.60 to 0.95 with angles of attack from -2 deg to 17 deg. On supercritical wing was designed to achieve a high level of transonic maneuver performance at a Mach number of 0.90; however, excessive flow separation developed on this wing at a Mach number of 0.85. A second supercritical wing was tested which had significantly reduced flow separation and improved drag characteristics at a Mach number of 0.85 and maintained the performance of the original wing at the higher Mach numbers. Leading-edge vortex generators did not improve the performance of the second wing; however, a sharp leading-edge flap produced sizable drag reductions at Mach numbers from 0.60 to 0.90. Author

N82-31304*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
HYBRID STATE VECTOR METHODS FOR STRUCTURAL DYNAMIC AND AEROELASTIC BOUNDARY VALUE PROBLEMS
Larry Lee Lehman Washington NASA Aug. 1982 195 p refs
(Grant NGL-05-020-243)
(NASA-CR-3591; NAS 1.26:3591) Avail: NTIS HC A09/MF A01 CSCL 01A

A computational technique is developed that is suitable for performing preliminary design aeroelastic and structural dynamic

analyses of large aspect ratio lifting surfaces. The method proves to be quite general and can be adapted to solving various two point boundary value problems. The solution method, which is applicable to both fixed and rotating wing configurations, is based upon a formulation of the structural equilibrium equations in terms of a hybrid state vector containing generalized force and displacement variables. A mixed variational formulation is presented that conveniently yields a useful form for these state vector differential equations. Solutions to these equations are obtained by employing an integrating matrix method. The application of an integrating matrix provides a discretization of the differential equations that only requires solutions of standard linear matrix systems. It is demonstrated that matrix partitioning can be used to reduce the order of the required solutions. Results are presented for several example problems in structural dynamics and aeroelasticity to verify the technique and to demonstrate its use. These problems examine various types of loading and boundary conditions and include aeroelastic analyses of lifting surfaces constructed from anisotropic composite materials. Author

N82-31305# Arizona Univ., Tucson. Engineering Experiment Station.

SURFACE GENERATION FOR AERODYNAMIC APPLICATIONS

H. Sobieczky (DFVLR, Goettingen, West Germany) Jun. 1981 22 p refs

(Contract N00014-76-C-0182)

(AD-A116263; TFD-81-03) Avail: NTIS HC A02/MF A01 CSCL 20/4

This paper describes an analytical procedure to obtain the geometry of wing-body combinations, missiles, rotors and propellers, to be used in computational algorithms as well as for automated tool manufacturing wind tunnel models for flow-field analysis, with emphasis on parametrical shape variations needed in aerodynamic design and optimization procedures. Analytical shape definition allows for arbitrary surface coordinates generation to be combined with three dimensional (flow space) grid generators. Present version of the code (E88-A) defines the wing along sections at constant span, with smooth deviations near the wing root section, which is projected onto the body surface. The body is defined by cross-section shapes based on superelliptic arcs, connecting analytic crown lines and planform projection curves. Wing sections are defined by an analytical blending between given root and central sections for the inner part of the wing, and the same between the central and tip section for the outer part of the wing. These three basic airfoils may be given as dense data from preceding two dimensional design or as relatively few spline supports for an interpolation technique of suitably stretched ordinates in order to density airfoil data. GRA

N82-31306# Arizona Univ., Tucson. Engineering Experiment Station.

TRANSONIC AIRFOILS WITH A GIVEN PRESSURE DISTRIBUTION

A. Hassan, A. Robert Seebass, and H. Sobieczky (DFVLR, Goettingen, West Germany) Jun. 1981 46 p refs Presented at the 14th AIAA Fluid and Plasma Dyn. Conf., Palo Alto, Calif. 23-25 Jun. 1981

(Contract N00014-76-C-0182; Grant AF-AFOSR-0107-81)

(AD-A116262; TFD-81-05) Avail: NTIS HC A03/MF A01 CSCL 20/4

An inverse design procedure for airfoils, based on hodograph techniques, has been developed. For subcritical flows the subsonic portion of the pressure distribution is prescribed; for supercritical flows the stream function on the sonic line is given instead of the supercritical portion of the pressure distribution. In the special variables we use, the equation for the stream fuction may be solved iteratively using a fast Poisson solver, for the subsonic portion of the flow; for supercritical flows, the supersonic portion is calculated using a characteristic calculation.

Author (GRA)

N82-31307# Ballistic Research Labs., Aberdeen Proving Ground, Md.

BRIEF EXAMINATION OF THE POSSIBILITY FOR CONDENSATION TRAILS TO OCCUR ON PROJECTILES DUE TO AEROTHERMODYNAMIC CAUSES Final Report

W. B. Sturek, C. J. Nietubicz, and J. Sahu Jun. 1982 43 p refs (DA Proj. 1L1-62618-AH-80)

(AD-A116193; AD-E300050; ARBRL-MR-03178) Avail: NTIS HC A03/MF A01 CSCL 19/1

Test firings of an Army projectile carrying a liquid payload resulted in sightings of a brief vapor trail early in the flight of the projectile. The possibility for aerothermodynamics to generate a visible condensation trail behind a shell is examined. Flow field computations using thin layer Navier-Stokes computational techniques were accomplished to define the local flow temperature distribution about a typical shell at M=.9 and M=2. These results indicate that small regions of flow exist that are conducive to produce condensation; however, these flow conditions are quickly modified by the presence of shock boundary layer interactions and recompression. It is concluded that aerothermodynamics is an unlikely cause of the reported projectile trails. Author

N82-31308# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

MATERIALS AND DESIGN CRITERIA FOR KEVLAR-29 RIBBON PARACHUTES Final Report, 1 Sep. - 1 Mar. 1980

William R. Pinnell Apr. 1982 267 p refs

(AF Proj. 2402)

(AD-A116357; AFWAL-TR-81-3138) Avail: NTIS HC A12/MF A01 CSCL 01/3

This report contains information and design criteria for application of Kevlar-29 (intermediate modulus para-aramid) textile materials to ribbon parachutes. Textile materials for this application are listed, their properties and limitations discussed, and methods for tensile testing presented. Twenty degree conical continuous ribbon parachute test items were designed and fabricated using Kevlar-29 textile materials entirely. The results of air drop and sled track testing at subsonic and transonic conditions are presented and design criteria based on these results are reported. The effects of reefing (two stages) on aerodynamic performance of the 15.3 ft nominal diameter parachutes is also reported. The report treats joining techniques for kevlar-29 parachute components and presents the results of tensile tests of joint samples. Design considerations and fabrication techniques related to application of Kevlar-29 materials are included. A comprehensive list of references useful to the parachute or decelerator system designer is provided. Author (GRA)

N82-31309# Sandia Labs., Albuquerque, N. Mex.

REDUCTION IN PARACHUTE DRAG DUE TO FOREBODY WAKE EFFECTS

Carl W. Peterson and Donald W. Johnson 1981 10 p refs Presented at the 7th AIAA Aerodyn. Decelerator and Balloon Technol. Conf., San Diego, Calif., 21 Oct. 1981

(Contract DE-AC04-76DP-00789)

(DE81-030124; SAND-81-0510C) Avail: NTIS HC A02/MF A01

The reduction in parachute drag due to forebody wake effects was predicted. The drag of a 20 deg conical ribbon parachute was measured at several axial stations behind an ogive cylinder forebody with and without fins. The same parachute was tested in undisturbed flow (where wake effects were negligible) so that the effects of suspension line length on parachute drag could be separated from the drag losses caused by the turbulent wake. Total head pressure surveys were made across the forebody wake and integrated across the canopy skirt area to determine the effective dynamic pressure acting on the parachute. Experimental results confirmed the validity of the underlying physical model of the parachute/wake interaction: the ratio of parachute drag behind a forebody divided by wake-free parachute drag is equal to the ratio of effective dynamic pressure acting on the parachute divided by freestream dynamic pressure. DOE

N82-31310# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

A FAST-SOLVER ALGORITHM FOR STEADY TRANSONIC

POTENTIAL-FLOW COMPUTATIONS WITH NEWTON ITERATION AND MULTIGRID RELAXATION
J. W. Boerstoel 10 Oct. 1981 24 p refs Presented at 4th GAMM Conf. on Numer. Methods in Fluid Dyn., Paris, 7-9 Oct. 1981
(Contract NIVR-1853)
(NLR-MP-81056-U) Avail: NTIS HC A02/MF A01

An algorithm based on an approximate Newton iteration of the nonlinear finite difference equations of transonic flow was tested on fully conservative potential flow around airfoils. It is found that the iteration to the circulation must be kept outside the multigrid algorithm. Meaningful residual norms, to be used in termination tests of loops, can be designed using finite-difference formulas with asymptotic scaling. Mass-flux-vector splitting solves instability problems encountered at sonic lines with artificial-viscosity terms. A special subalgorithm outside the multigrid algorithm is needed to update shock positions. The Newton/multigrid algorithm is very efficient for subsonic flows around airfoils with lift. For transonic flows, the algorithm is convergent.
Author (ESA)

N82-32262# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ONE-DIMENSIONAL NONLINEAR CONSIDERATIONS ON SUPERSONIC DIFFUSER BUZZ
Hermann-L. Weinreich *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 14 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32264# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
JET-AFTERBODY INTERFERENCE ON MISSILES IN SUPERSONIC FLOW
Bernhard Wagner *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 11 p refs Sponsored in part by the German Ministry of Defense (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N82-31311*# Virginia Univ., Charlottesville. Dept. of Mechanical Engineering.
IDENTIFICATION OF TERMS TO DEFINE UNCONSTRAINED AIR TRANSPORTATION DEMANDS Final Report, 26 Mar. 1980 - 31 Aug. 1981
Ira D. Jacobson and A. Robert Kuhilhau Apr. 1982 60 p refs (Contract NAS1-14908)
(NASA-CR-165961; NAS 1.26:165961;
UVA/528194/MAE-CE82/101) Avail: NTIS HC A04/MF A01 CSCL 01C

The factors involved in the evaluation of unconstrained air transportation systems were carefully analyzed. By definition an unconstrained system is taken to be one in which the design can employ innovative and advanced concepts no longer limited by present environmental, social, political or regulatory settings. Four principal evaluation criteria are involved: (1) service utilization, based on the operating performance characteristics as viewed by potential patrons; (2) community impacts, reflecting decisions based on the perceived impacts of the system; (3) technological feasibility, estimating what is required to reduce the system to practice; and (4) financial feasibility, predicting the ability of the concepts to attract financial support. For each of these criteria, a set of terms or descriptors was identified, which should be used in the evaluation to render it complete. It is also demonstrated that these descriptors have the following properties: (a) their interpretation may be made by different groups of evaluators; (b) their interpretations and the way they are used may depend on the stage of development of the system in which they are used; (c) in formulating the problem, all descriptors should be addressed independent of the evaluation technique selected. Author

N82-31312# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
FLIGHT PLAN FILING BY SPEECH RECOGNITION Final Report
Ephraim Shochet, Paul Quick, and Louis Delemarre Jul. 1982 67 p
(FAA Proj. 131-402-540)
(DOT/FAA/RD-82/39; DOT/FAA/CT-81/64) Avail: NTIS HC A04/MF A01

Automatic flight plan filing by machine recognition is discusssed. The utterance recognition device (URD) was upgraded in preparation for testing the capabilities of voice input for automatic flight plan filing. The URD was modified to include more reliable components, where advisable, and a larger memory to handle the expanded vocabulary. In addition, a dialect study was conducted to determine the locations for collecting a nationally representative voice sample in order to create reference patterns capable of performing well on all American dialects. Subsequently, over 5,000 voices from 24 cities throughout the United States were collected and processed. Initial tests were conducted in which subjects filed simulated flight plans directly into the URD over the telephone. The results indicated that the prototype system, as demonstrated using the adaptation strategy for flight plan filing, has definite potential for application in Model two of the flight service automation program. Moreover, a comparison between the old and new recognition algorithms indicates that the improvement in accuracy with the new data base raises the performance of the mass weather dissemination program to a level quite satisfactory for the general pilot population. S.L.

N82-31313# Federal Aviation Administration, Washington, D.C.
SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSE TO NATIONAL TRANSPORTATION SAFETY BOARD SAFETY RECOMMENDATIONS Quarterly Report, Jul. - Sep. 1981
R. E. Livingston and C. A. Carpenter Oct. 1981 320 p refs
(AD-A115485; DOT/FAA/ASF-81/5) Avail: NTIS HC A14/MF A01 CSCL 05/4

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions. The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as 'Closed' by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-81-36 through 38), but background material is included only for those recommendations which remain in an 'Open' status. Background information for those recommendations which have been closed is available in FAA Headquarters files. Author (GRA)

N82-31314# Federal Aviation Administration, Washington, D.C. Office of Aviation Safety.
SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSE TO NATIONAL TRANSPORTATION SAFETY BOARD SAFETY RECOMMENDATIONS Quarterly Report, Oct. - Dec. 1981
R. E. Livingston and C. A. Carpenter Jan. 1982 412 p refs
(AD-A115486; DOT/FAA/ASF-81/6) Avail: NTIS HC A18/MF A01 CSCL 05/04

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions. The Table of Contents for

this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as 'Closed' by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-81-88 through 91), but background material is included only for those recommendations which remain in an 'Open' status. Background information for those recommendations which have been closed is available in FAA Headquarters files. Author (GRA)

N82-32300# Joint Publications Research Service, Arlington, Va.
AIRBUS A 310 WILL COMPETE WITH BOEING 767 FOR MARKET
Pierre Kerlouegan *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 44-47 Transl. into ENGLISH from Le Figaro (France), 17 Feb. 1982 p 9 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N82-31315# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
FAA ACCEPTANCE TESTS ON THE NAVIGATION SYSTEM USING TIME GLOBAL POSITIONING SYSTEM Z SET RECEIVER Final Report, Jun. - Dec. 1979
Robert J. Esposito Jul. 1982 21 p refs
(FAA Proj. 049-330-110)
(DOT/FAA/RD-82/9) Avail: NTIS HC A02/MF A01

Acceptance tests on the Navigation System Using Time and Ranging (NAVSTAR) Global Positioning System (GPS) Z-set receiver are described. The Yuma laser tracking system computed a reference trajectory against which the GPS receiver solution was compared. Data from five flights, totaling over 6 hours, are presented with the objective of assessing Z-set capabilities to meet civil aviation requirements for nonprecision approaches. Author

N82-31316# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
INITIAL FAA TESTS ON THE NAVIGATION SYSTEM USING TIME AND RANGING GLOBAL POSITIONING Interim Report, Apr. - Dec. 1980
Robert J. Esposito Jul. 1982 16 p refs
(FAA Proj. 049-330-110)
(DOT/FAA/RD-82/8; DOT/FAA/CT-81/73) Avail: NTIS HC A02/MF A01

The Federal Aviation Administration (FAA) received a Navigation System Using Time and Ranging (NAVSTAR) Global Positioning System (GPS) Z-set for independent test and evaluation after this receiver was acceptance tested aboard a United States Air Force C-141 aircraft over the Yuma Proving Ground instrumented range. This report describes the initial familiarization studies conducted by the FAA in a twin turboprop engine Grumman Gulfstream with the Z-set in a stand alone configuration. The familiarization studies included satellite shielding tests, satellite acquisition/reacquisition tests, nonprecision approaches to five east coast airports, and operations in high noise/radiofrequency interference (RFI) environments (over airports, cities, and television towers). Author

N82-31317# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
RELIABILITY AND MAINTAINABILITY EVALUATION OF THE MODE S SYSTEM Final Report, Oct. 1978 - May 1980
Arthur R. Moss and George C. Apostolakis May 1982 43 p refs
(FAA Proj. 034-241-510)
(AD-A116401; DOT/FAA/CT-81/42; FAA-RD-81-54) Avail: NTIS HC A03/MF A01 CSCL 17/7

A reliability and maintainability evaluation was performed on Mode S (formerly the Discrete Address beacon System (DABS)) engineering model sensors. The observed system mean time between failure (MTBF) based on chargeable failures ranged from 767 hours to 1,913 hours. Elements which failed and caused system outraged at three sites were the transmitter, processor, and WWVB receiver. The transmitter and processor, which are single string elements, were found to be the weak points in the system reliability design. The measured failure rates for these two elements, in particular the processor, exceeded the predicted values. Problem areas were: inadequate ratio station WWVB receiver output; damage to wire wrap pin in the computer ensembles caused by power cables rubbing against them, excessive failures in the traveling wave tube associated circuitry, failure of cooling fans, susceptibility of the sensor to lightning damage, and loose and dirty printed circuit board contacts. GRA

N82-31318# Mitre Corp., McLean, Va. Metrek Div.
OPERATIONAL AND FUNCTIONAL REQUIREMENTS FOR THE NAVIGATION SYSTEM IN TERMINAL AREAS Final Report
Satish C. Mohleji Feb. 1982 63 p refs
(Contract DOTA01-82-C-10003)
(AD-A116127; MTR-82W13; FAA-RD-82-10) Avail: NTIS HC A04/MF A01 CSCL 17/7

A comprehensive set of operational requirements relating the capabilities of the navigation system and its use in the ATC environment are developed in this paper by modifying the operational requirements for MLS established by the International Civil Aviation Organization. In order to establish the functional requirements, an interrelationship is established between the navigation system parameters, route geometry and ATC procedures considering system uncertainties. An impact of each ATC uncertainty (navigation, surveillance, communication delays, airspeeds and winds) is first examined individually by computing the time dispersions between the planned vs. the achieved aircraft performance. Then a total dispersion and control interaction is established by calculating the time variability due to speed adjustments permitted under ATC procedures, and by statistically combining the impact of the ATC uncertainties using a root sum square (RSS) approach. This technique is general enough to permit evaluation of functional requirements (accuracy, coverage and channel capacity) of any navigation system under varying ATC parameters, procedures and operational requirements. GRA

N82-31319# Mitre Corp., McLean, Va. Metrek Div.
ANALYSIS OF ACTIVE BCAS ALERT RATES AND PROTECTION BASED ON ACTUAL AIRCRAFT TRACKS Final Report
Lillian B. Zarrelli Feb. 1982 239 p refs
(Contract DTFA01-82-C-10003)
(AD-A116402; MTR-80W267; FAA-RD-82-33) Avail: NTIS HC A11/MF A01 CSCL 17/7

This document describes an evaluation of the performance of the Active Beacon Collision Avoidance System (Active BCAS) using the Houston data base and simulated midair collision scenarios. The Houston data was extracted from ARTS III tapes and consisted of 65 hours of operation. This data was used to measure alert rates and assess desensitization techniques aimed at reducing the number of unnecessary alerts. The midair data base consisted of the reconstructed flight paths of 15 actual midair collisions. Measures of protection and tradeoffs were made based on the performance of the BCAS logic in resolving these simulated collision scenarios. Author (GRA)

N82-31320# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
DECENTRALIZED RELATIVE NAVIGATION AND JTIDS/GPS/INS INTEGRATED NAVIGATION SYSTEMS Final Report, Aug.

1979 - Oct. 1981
William S. Widnall, Giuseppe F. Gobbini, and John F. Kelley Wright-Patterson AFB, Ohio AFWAL Jan. 1982 220 p refs
(Contract F33615-79-C-1879; AF Proj. 666A)
(AD-A116417; AFWAL-TR-81-1264) Avail: NTIS HC A10/MF A01 CSCL 17/7

One contribution of this research is a deeper understanding of the stability and performance of community relative navigation, such as is currently implemented in the Joint Tactical Information Distribution System (JTIDS). Relative navigation in the JTIDS system is organized in a decentralized manner with the Kalman filter in each member estimating only the member's own navigation state, but based on measurements that rely in part on the reported positions of other members. Simulations have shown the interacting navigation solutions can be unstable. We have found an analytical proof of the stability of one decentralized organization-the fixed rank hierarchy. Next an alternate approach for the community navigation, based on measurement sharing, is presented. This alternate has no stability difficulties, has superior accuracy, but has some increase in communication and computer requirements. Another contribution of this research is an assessment of the benefits of and approaches to integrating the data from JTIDS, GPS, and inertial systems. Finally, an extensive FORTRAN simulation of the performance of JTIDS/GPS/INS integrated navigation in a multi-member environment has been developed and is used to explore the performance of both JTIDS/INS navigation and JTIDS/GPS/INS navigation.
Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-31321*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL INVESTIGATION OF ACTIVE LOADS CONTROL FOR AIRCRAFT LANDING GEAR
John R. McGehee and Robert C. Dreher Aug. 1982 72 p refs
(NASA-TP-2042; L-15224; NAS 1.60:2042) Avail: NTIS HC A04/MF A01 CSCL 01C

Aircraft dynamic loads and vibrations resulting from landing impact and from runway and taxiway unevenness are recognized as significant in causing fatigue damage, dynamic stress on the airframe, crew and passenger discomfort, and reduction of the pilot's ability to control the aircraft during ground operations. One potential method for improving operational characteistics of aircraft on the ground is the application of active control technology to the landing gears to reduce ground loads applied to the airframe. An experimental investigation was conducted which simulated the landing dynamics of a light airplane to determine the feasibility and potential of a series hydraulic active control main landing gear. The experiments involved a passive gear and an active control gear. Results of this investigation show that a series hydraulically controlled gear is feasible and that such a gear is very effective in reducing the loads transmitted by the gear to the airframe during ground operations. Author

N82-31322# Arizona Univ., Tucson. Engineering Experiment Station.
AN EFFECTIVE ALGORITHM FOR SHOCK-FREE WING DESIGN
K.-Y. Fung, A. Robert Seebass, L. J. Dickson, and C. F. Pearson Jun. 1981 31 p refs Presented at the 14th AIAA Fluid and Plasma Dyn. Conf., Palo Alto, Calif., 23-25 Jun. 1981
(Contract N00014-76-C-0182)
(AD-A116265; TFD-81-06) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper reviews the fictitious gas procedure of Sobieczky for finding shockfree airfoils and wings. Results for inviscid and viscous flows for airfoils and wings are described. The method is applied to a business jet planform resulting in a wing that should have good low speed characteristics as well as an M-infinity L/D that is near the maximum achievable for the wing lift and thickness chosen for the study. GRA

N82-31323# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE MANEUVERABLE ATMOSPHERIC PROBE (MAP), A REMOTELY PILOTED VEHICLE Final Report
Roberto Rubio, Claude L. Tate, Maynard L. Hill, Harold N. Ballard, Mike Izquierdo, and Carlos McDonald May 1982 56 p refs
(DA Proj. 1L1-62111-AH-71)
(AD-A116118; ERADCOM/ASL-TR-0110) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report documents, in considerable detail, the physical and aerodynamic characteristics of the 10-hp, 36.5-kg, radio-controlled MAP aircraft, as well as the novel fluidic and electrostatic vertical stabilizer systems assisting in aircraft control. The atmospheric and aerodynamic sensor configurations, including the sensor data telemetry system, are described. Three distinct flight experiments were conducted with the instrumented MAP vehicle. During the first experiment, dust particulate samples, raging in size from 0.2 micrometer to 400 micrometer, were obtained by flying the RPV-mounted samplers through low altitude dust clouds generated by ground-based 105-mm artillery shell explosions. Data from this experiment are presented. The second experiment involved characterizing typical atmospheric conditions along a laser propagation range (path). Graphs of atmospheric temperature, pressure, RH, and derived air density, all as functions of RPV altitude, present data that are representative of those obtained from the second experiment. Measurement accuracies for temperature, pressure, and RH are respectively shown to be plus or minus 1 deg C, plus or minus 2 percent of the total pressure and plus or minus 4 percent of actual RH. The third experiment was conducted with the instrumented RPV being flown near a mountain peak whose altitude is 2440 millimeter relative to mean sea level (msl). Atmospheric electric field intensity and turbulence structure measurements as functions of RPV position relative to the mountain peak make up the third set of data presented in this report. GRA

N82-31324# Army Natick Research and Development Command, Mass.
SIMULATION OF THE INTERACTION BETWEEN AIRDROP PLATFORMS AND AIRCRAFT ROLLERS
Earl C. Steeves Apr. 1982 54 p
(DA Proj. 1L1-62210-D-283)
(AD-A116370; NATICK/TR-82/014) Avail: NTIS HC A04/MF A01 CSCL 01/2

All airdrop loads must be certified as not exceeding the maximum aircraft roller loads. This certification is presently accomplished by a series of tests which are numerous and complex. This report looks at the possibility of replacing this test procedure with a numerical simulation. Two simulations are examined; a straightforward deterministic structural simulation and a structural simulation that includes the imperfections in the system in a statistical manner. The imperfections in the system are large enough to make the deterministic structural model inadequate, and insufficient data are available to make an accurate statistical model of the imperfections. As a result, it was not possible to develop a complete model to carry out the roller load simulation, although only the imperfection model is needed for completion of the statistical simulation. The statistical model was used to demonstrate that the use of very flexible rollers would reduce the importance of the imperfections in the system. GRA

N82-31325# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.
A METHOD FOR DESIGNING INLET DISTORTION SCREENS FOR AIRCRAFT GAS TURBINE ENGINE TESTS USING AN INTERACTIVE COMPUTER PROGRAM Final Report
Robert E. Anderson May 1982 35 p ref

(AD-A116584; NAPC-PE-66) Avail: NTIS HC A03/MF A01 CSCL 21/5

The design of inlet distortion screens used for testing aircraft gas turbine engines can be facilitated by using an interactive computer program. This report describes a computer program which has been developed by the Naval Air Propulsion Center to aid in the screen design process. The computer program can be used to establish the initial screen design and to develop modifications after the screen is tested. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N82-31326*# Analytical Mechanics Associates, Inc., Mountain View, Calif.

FUNCTIONAL DESIGN TO SUPPORT CDTI/DABS FLIGHT EXPERIMENTS Final Report

Tsuyoshi Goka Jul. 1982 170 p refs

(Contract NAS1-16802)

(NASA-CR-165947; NAS 1.26:165947) Avail: NTIS HC A08/MF A01 CSCL 01D

The objectives of this project are to: (1) provide a generalized functional design of CDTI avionics using the FAA developed DABS/ATARS ground system as the 'traffic sensor', (2) specify software modifications and/or additions to the existing DABS/ATARS ground system to support CDTI avionics, (3) assess the existing avionics of a NASA research aircraft in terms of CDTI applications, and (4) apply the generalized functional design to provide research flight experiment capability. DABS Data Link Formats are first specified for CDTI flight experiments. The set of CDTI/DABS Format specifications becomes a vehicle to coordinate the CDTI avionics and ground system designs, and hence, to develop overall system requirements. The report is the first iteration of a system design and development effort to support eventual CDTI flight test experiments. Author

N82-31327# Smiths Industries, Inc., Clearwater, Fla.

FINAL ENGINEERING REPORT FOR COMPUTER, WEAPON AIMING CP-1444/A Final Report

M. D. Caramichael 1 Jun. 1982 175 p refs

(Contract N00019-77-A-0350)

(AD-A115238; SI-0519) Avail: NTIS HC A08/MF A01 CSCL 19/5

The WAC performs the following general functions: (1) Signal conditioning of the aircraft attitude sensor data for use by the Head-Up Display (HUD) system; (2) Air-to-air lead angle computation for the HUD air-to-air gunsight; (3) Air-to-ground weapon depression and across-wind aimpoint computation for the HUD air-to-ground Continuously Computed Impact Point (CCIP) weapon release cue; and (4) Breakway warning computation for terrain and weapon fragmentation avoidance for the HUD air-to-ground CCIP mode. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-31328*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

DEVELOPMENT OF A SPINNING WAVE HEAT ENGINE Final Report

B. T. Zinn, E. A. Powell, and J. E. Hubbartt Aug. 1982 100 p refs

(Grant NAG3-96)

(NASA-CR-165611; NAS 1.26:165611) Avail: NTIS HC A05/MF A01 CSCL 21E

A theoretical analysis and an experimental investigation were conducted to assess the feasibility of developing a spinning wave heat engine. Such as engine would utilize a large amplitude traveling acoustic wave rotating around a cylindrical chamber, and it should not suffer from the inefficiency, noise, and intermittent thrust which characterizes pulse jet engines. The objective of this investigation was to determine whether an artificially driven large amplitude spinning transverse wave could induce a steady flow of air through the combustion chamber under cold flow conditions. In the theoretical analysis the Masien and Moore perturbation technique was extended to study flat cylinders (pancake geometry) with completely open side walls and a central opening. In the parallel experimental study, a test moel was used to determine resonant frequencies and radial pressure distributions, as well as oscillatory and steady flow velocities at the inner and outer peripheries. The experimental frequency was nearly the same as the theoretical acoustic value for a model of the same outer diameter but without a central hole. Although the theoretical analysis did not predict a steady velocity component, simultaneous measurements of hotwire and microphone responses have shown that the spinning wave pumps a mean flow radially outward through the cavity. Author

N82-31329*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VENTURI NOZZLE EFFECTS ON FUEL DROP SIZE AND NITROGEN OXIDE EMISSIONS

Susan M. Johnson Aug. 1982 17 p refs

(NASA-TP-2028; E-1029; NAS 1.60:2028) Avail: NTIS HC A02/MF A01 CSCL 21E

The effect of a venturi nozzle on the Sauter mean diameter of a water spray produced by a simplex pressure atomizing injector in a swirling airflow was determined. A Malvern particle and droplet size distribution analyzer, Type S.T. 1800, was used to measure D sub 32 of the water sprays. The water spray was studied at ambient temperature (293 K) and atmospheric pressure. The venturi reduced D sub 32 by an average of 30 percent when installed with a simplex injector and air swirler. The venturi primarily improved atomization of the injector spray by increasing relative air velocity. The small drop size enhanced vaporization and therefore decreased oxides of nitrogen in a combustor. The decrease in drop size provided by the addition of a venturi explains the results obtained in a previous small scale research combustor wherein NOx emission indices decreased as a result of this hardware modification. S.L.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-31330*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.

SINGULAR PERTURBATION TECHNIQUES FOR REAL TIME AIRCRAFT TRAJECTORY OPTIMIZATION AND CONTROL Final Report, Feb. 1978 - Dec. 1981

Anthony J. Calise and Daniel D. Moerder NASA Washington Aug. 1982 111 p refs

(Grant NsG-1496)

(NASA-CR-3597; NAS 1.26:3597) Avail: NTIS HC A06/MF A01 CSCL 01C

The usefulness of singular perturbation methods for developing real time computer algorithms to control and optimize aircraft flight

trajectories is examined. A minimum time intercept problem using F-8 aerodynamic and propulsion data is used as a baseline. This provides a framework within which issues relating to problem formulation, solution methodology and real time implementation are examined. Theoretical questions relating to separability of dynamics are addressed. With respect to implementation, situations leading to numerical singularities are identified, and procedures for dealing with them are outlined. Also, particular attention is given to identifying quantities that can be precomputed and stored, thus greatly reducing the on-board computational load. Numerical results are given to illustrate the minimum time algorithm, and the resulting flight paths. An estimate is given for execution time and storage requirements. Author

N82-31331# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
DESIGN OF ADVANCED DIGITAL FLIGHT CONTROL SYSTEMS VIA COMMAND GENERATOR TRACKER (CGT) SYNTHESIS METHODS, VOLUME 1 M.S. Thesis
Richard M. Floyd Dec. 1981 226 p refs 2 Vol.
(AD-A115510; AFIT/GE/EE/81-20-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 01/2

This study develops a computer program for interactive execution to aid in the design of Command Generator Tracker control systems employing Proportional-plus-Integral inner-loop controllers and Kalman Filters for state estimation (CGT/PI/KF controllers). Design parameters are specified in the continuous-time domain and the computer program obtains the corresponding discrete-time parameters and determines a direct digital design for sampled-data implementation. Designs are based upon the Linear system mode, Quadratic cost, and Gaussian noise process (LQG) assumptions of optimal control theory. The report discusses the theoretical background and applications of optimal model-following designs which preceded the CGT theory. A development of the CGT/PI/KF controller theory is presented, and performance evaluation tools for the controller design are discussed. Following a brief description of the computer program developed, results of applying it to example aircraft-related controller design problems are presented and discussed. GRA

N82-31332# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
DESIGN OF ADVANCED DIGITAL FLIGHT CONTROL SYSTEMS VIA COMMAND GENERATOR TRACKER (CGT) SYNTHESIS METHODS, VOLUME 2 M.S. Thesis
Richard M. Floyd Dec. 1981 246 p refs 2 Vol.
(AD-A115511; AFIT/GE/EE/81-20-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 01/2

CGTPIF is a controller design program which executes interactively. Three design paths are offered: (1) design of a Proportional-plus-Integral (PI) regulator via linear-quadratic (LQ) methodology; (2) design of a Command Generator Tracker, either open-loop (CGT) or closed-loop (CGT/PI); and (3) design of a Kalman filter (KF). These three designs are components of a final controller implemented as a Command Generator Tracker, with an inner-loop proportional-plus-integral regulator, and a Kalman filter for state estimation (CGT/PI/KF). For each design path there is a corresponding set of routines to evaluate the quality of the design achieved. The program is written in FORTRAN IV and consists of about 2500 lines of source code. In addition, numerous routines are employed from a library of matrix routines described in Reference 24. Author (GRA)

N82-31333# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
DESCRIPTION OF A SIMPLE MODEL TO DETERMINE LANDING GEAR FORCES DURING THE TAKEOFF OF AERODYNAMICALLY UNSTABLE AIRCRAFT [BESCHREIBUNG EINES EINFACHEN MODELLS ZUR ERMITTLUNG VON FAHRWERKSKRAEFTEN WAEHREND DES STARTVORGANGS EINES AERODYNAMISCHES INSTABILEN FLUGZEUGS]
M. Soelter 25 Nov. 1981 43 p refs In GERMAN
(EX-22B) Avail: NTIS HC A03/MF A01

A simple model to simulate the lateral motion during the takeoff of an aerodynamically unstable aircraft is presented. By neglecting the landing gear dynamics no additional solution of the corresponding differential equations was required. Landing gear forces were determined from the geometrical ratios of the aircraft to the ground reference line. This procedure is particularly efficient when no high frequency landing gear drive-as, e.g., during touchdown has to be taken into account. The objection free function of the control concept for an aircraft aerodynamically unstable in the lateral plane is shown. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N82-31334# Oak Ridge National Lab., Tenn. Fusion Energy Div.
USING GIFTS ON THE CRAY-1 FOR THE LARGE COIL TEST FACILITY TEST STAND DESIGN ANALYSIS
T. V. Baudry and W. H. Gray Jun. 1981 22 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7665) Avail: NTIS HC A02/MF A01

The GIFTS finite element program was used extensively throughout the Large Coil Test Facility (LCTF) test stand design analysis. Effective use was made of GIFTS both as a preprocessor to other finite element programs and as a complete structural analysis package. The LCTF test stand design involved stress analysis ranging from simple textbook type problems to very complicated three dimensional structural problems. Two areas of the design analysis are discussed. Author

N82-31335# Goulding (Merrill K.) and Associates, Glendale, Calif.
STUDY OF THE DE-ICING PROPERTIES OF THE ASDE-3 ROTODOME Final Report, Sep. 1978 - Sep. 1980
Merrill K. Goulding Washington FAA Apr. 1982 132 p refs
(Grant DOT-TSC-15950)
(AD-A115445; DOT/FAA/RD-81/112; DOT-TSC-FAA-81-24; DTS-541) Avail: NTIS HC A07/MF A01 CSCL 01/5

A study was conducted of the thermal characteristics of the ASDE-3 system's rotating radome (rotodome), a spheri-toroidal thin wall structure, approximately 18 feet in diameter and 6 feet in height. The purpose of the study was to determine the thermal transmissivities of the various regions of the design, discover 'hot spots,' determine the need for insulation, heater exhaust deflectors and other enhancements, and to make a prediction of the ability of its heaters to prevent system outages due to ice accretion on the rotodome. An analysis made using test data to predict the ability of the rotodome to resist icing conditions was very encouraging, demonstrating that convection becomes the dominant mode of heat loss during high wind conditions. A conservative analysis was made with winds applied at full velocity across all regions of the rotodome. The results indicate that the goal of de-icing the rotodome appears achievable using 30 kW of power. Although there are hot spots about the rotodome, the de-icing function using the hot air blower system is satisfactory. To reduce hot spots near the blower assembly, a deflector is recommended at the output of the blower. Author (GRA)

N82-31336# American Airlines, Inc., Ft. Worth, Tex.
WIDE-ANGLE, MULTIVIEWER, INFINITY DISPLAY SYSTEM Final Report
Ian Whyte and A. W. Zepf Jun. 1982 95 p refs
(Contract F33615-79-C-0002)
(AD-A116308; AFHRL-TR-81-27(1)) Avail: NTIS HC A05/MF A01 CSCL 05/9

This study examined the design specification for a wide angle

infinity display system with minimal distortion, convergence, dipvergence, and collimation errors for use on wide body aircraft simulators. The report includes a recommended final design specification; a survey of potential fabrication technologies for projector, screen and large mirrors; an approach to fabrication of a large display system; and finally, assembly and alignment techniques of mirror segments for a large display. (Note: Dipvergence refers to vertical movement of eyes up and down as opposed to side to side.) GRA

N82-31337# Oak Ridge National Lab., Tenn.
KRYPTON-85 POWERED LIGHTS FOR AIRFIELD APPLICATION Final Report, Oct. 1979 - Sep. 1980
F. Neil Case and Karl W. Haff Nov. 1981 24 p refs
(AD-A116455; AFESC/ESL-TR-80-55) Avail: NTIS HC A02/MF A01 CSCL 01/5

Airfield lighting is complex in its requirements for lights of various intensities and colors. Some applications such as taxiway lights, information signs, and combat situations may be served by lights of relatively low intensity. They should meet criteria such as energy efficiency, little or no dependence upon batteries or generators, low maintenance, and rapid deployment. Lights powered with krypton-85 provide some of these advantages. This report summarizes an effort to develop krypton-85 powered airfield lighting. Light is produced when beta rays from krypton-85 excite a phosphor. Phosphors selected produced blue, red, and yellow-green light. Field testing of the lights was sufficiently encouraging to continue development in a follow-on effort. Author (GRA)

N82-31338# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
CALIBRATION AND PERFORMANCE OF THE AEDC/VKF TUNNEL C, MACH NUMBER 4, AEROTHERMAL WIND TUNNEL Final Report, 15 May - 18 Dec. 1981
W. T. Strike, Jr. Jun. 1982 117 p refs
(AD-A116279; AEDC-TR-82-6) Avail: NTIS HC A06/MF A01 CSCL 14/2

The shakedown and calibrated characteristics of the new AEDC Mach Number 4 Aerothermal Wind Tunnel were experimentally identified at several test conditions. The nominal Mach number of the test core as defined by a 30-probe pitot pressure rake varied between nominally 3.95 and 4.0, depending on the test section Reynolds number and stilling chamber temperature. The overall variation in the stilling chamber pressure is nominally 15 to 180 psia, with temperatures from 250 to 1,210 F for an overall Reynolds number range of 0.2 to 8.1 million per foot and true temperature-pressure altitude simulation from 56,000 to 105,000 ft. Author (GRA)

N82-31339# Los Alamos Scientific Lab., N. Mex.
ALL-METAL VACUUM CHAMBER FOR THE ZT-40 EXPERIMENT
R. S. Dike and J. N. Downing Oct. 1981 6 p refs Presented at the 9th Symp. for Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002384; LA-UR-81-3133; CONF-811040-47) Avail: NTIS HC A02/MF A01

The design and fabrication of the all-metal vacuum chamber presently in use in the ZT-40 device are discussed. ZT-40 is the current experiment in the Los Alamos Reversed-Field Pinch (RFP) program. The new vessel, which replaces a ceramic one, is made of Inconel 625 and has major and minor diameters of 228 cm and 40 cm, respectively. It consists of 24 convoluted and straight sections welded into a single toroidal geometry. Presented are several design features showing diagnostic and vacuum port tubulations and thermal-electrical insulation isolating the unit from its conducting shell. We also discuss fabrication techniques and our procedure for cleaning and heat treatment designed to eliminate residual gas contamnation in the Inconel material. DOE

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-31340*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EXTRATERRESTRIAL MATERIALS PROCESSING
Wolfgang H. Steurer 15 Apr. 1982 147 p refs
(Contract NAS7-100)
(NASA-CR-169268; JPL-Publ-82-41; NAS 1.26:169268) Avail: NTIS HC A07/MF A01 CSCL 22A

The first year results of a multi-year study of processing extraterrestrial materials for use in space are summarized. Theoretically, there are potential major advantages to be derived from the use of such materials for future space endeavors. The types of known or postulated starting raw materials are described including silicate-rich mixed oxides on the Moon, some asteroids and Mars; free metals in some asteroids and in small quantities in the lunar soil; and probably volatiles like water and CO2 on Mars and some asteroids. Candidate processes for space materials are likely to be significantly different from their terrestrial counterparts largely because of: absence of atmosphere; lack of of readily available working fluids; low- or micro-gravity; no carbon-based fuels; readily available solar energy; and severe constraints on manned intervention. The extraction of metals and oxygen from lunar material by magma electrolysis or by vapor/ion phase separation appears practical. Author

N82-31341*# Alabama Univ., Huntsville.
ELECTRODEPOSITION IN MICROGRAVITY: GROUND-BASED EXPERIMENTS Final Report, 13 May 1981 - 30 Jun. 1982
Clyde Riley and H. Dwain Coble Jun. 1982 28 p refs
(Contract NAS8-33812)
(NASA-CR-162069; NAS 1.26:162069) Avail: NTIS HC A03/MF A01 CSCL 22A

Electrodeposition was studied at one-hundreth g and compared with bench studies at 1 g. The low gravity was achieved during KC-135 aircraft parobolic flights. Flow in a simple cobalt cell (1 M CoSO4) operating under typical commercial conditions (10 to 20 mA/sq cm and < 1 V) was monitored with a Schlieren optical system. Natural convection was absent at one-hundreth g. Quantitative comparisons on a cobalt cell with shielded electrodes using interferometry were carried out. Fringe shift differences indicate greater semi-infinite linear diffusion at 1 g than at one-hundreth g for cobalt. Since a shielded electrode operates under diffusion controlled conditions, no differences between 1 g and one-hundreth g would be expected. Similar comparisons on a shielded electrode copper cell were inconclusive. Bench codeposition experiments using polystyrene neutral buoyancy particles coupled with a shielded electrode cobalt cell were begun. Tracking of 12 micron particles showed no measurable difference between thermal/Brownian motion when the cell was operational or nonoperational. Initial experiments on codeposition quality showed a strong dependence upon cathode surface preparation in a shielded electrode configuration. S.L.

N82-32276# Joint Publications Research Service, Arlington, Va.
CHRONOLOGY OF SALYUT-7 FLIGHT
In its USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 1-5 Transl. into ENGLISH of various Russian articles (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32290# Joint Publications Research Service, Arlington, Va.
MILITARIZATION OF U.S. SPACE PROGRAM ALLEGED
A. Timofeyev *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 91-93 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 42-43 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32291# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON U.S. SPACE POLICY AND PROGRAMS
I. I. Isachenko *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 94-103 Transl. into ENGLISH from Ekon. i Organ. Prom. Proizv. (USSR), no. 1, Jan. 1981 p 171-186 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-31342# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DETERMINATION OF SIMPLIFIED ANALYTICAL EXPRESSIONS FOR THE CALCULATION AND PROPAGATION OF ORBITS BY THE USE OF THE THEORY OF PARAMETER ESTIMATION Ph.D. Thesis [DETERMINACAO DE EXPRESSOES ANALITICAS SIMPLIFICADAS PARA CALCULO E PROPAGACAO DE ORBITAS MEDIANTE O USO DE TEORIA DE ESTIMACAO DE PARAMETROS]
Wilson Custodio Canesin daSilva Feb. 1982 112 p refs In PORTUGUESE
(INPE-2320-TDL/080) Avail: NTIS HC A06/MF A01

The principal perturbations on artificial satellites orbits are discussed and an approximated mathematical model using parameterized expressions is proposed to represent the time variation of orbit elements. The parameters in these expressions are determined from observational (or simulated) data, employing estimation theory through the use of Kalman filtering sequential techniques. The analytical expressions obtained allow orbit predictions with significant saving in time and without the need of sophisticated computational resources. Author

N82-31343# McDonnell-Douglas Astronautics Cc., Huntington Beach, Calif.
ELECTRIC FIELDS IN EARTH ORBITAL SPACE Annual Report
W. P. Olson, K. A. Pfitzer, and S. J. Scotti May 1982 48 p refs (Contract N00014-80-C-0796)
(AD-A116400; MDC-H0087) Avail: NTIS HC A03/MF A01 CSCL 20/3

This is a report of progress during the past year. The work was performed in three areas with a long term goal understanding the formation and maintenance of electrostatic fields in the earth's magnetosphere. The entry of low energy charged particles into a magnetically closed magnetosphere has been examined in some detail. Entry is permitted because of the non-uniform nature of the magnetic field over the magnetopause surface. Electrostatic fields may be formed across the tail of the magnetosphere because fo the different 'entry efficiencies ' of protons and electrons. The consequences of this particle entry mechanism for the plasma sheet, plasma mantle, and boundary plasmas in the magnetosphere are examined. The mathematics of particle entry was investigated in a one-dimensional boundary using both kinetic theory and bulk MHD parameters. From our participation in the 6th Coordinated Data Analysis Workshop, we have determined that at least during disturbed magnetic conditions, currents persist near geosynchronous orbit in the nightime region which are presently not included in our dynamic magnetic field models. These currents are probably associated with the field aligned currents which close in the ionosphere near auroral latitudes. Author (GRA)

N82-31344# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
SEASAT ORBIT DETERMINATION FROM LASER RANGE OBSERVATIONS
K. F. Wakker, B. A. Ambrosius, and T. vanderPloeg Apr. 1982 36 p refs Presented at SURGE Discussion Meeting on SEASAT in Europe, London, 14-16 Apr. 1982
(VTH-LR-352) Avail: NTIS HC A03/MF A01

The sensitivity of SEASAT orbit solutions and parameter estimations to the applied gravity and atmospheric drag model was investigated. For the gravity field the NASA GEM-9, GEM-10B, PGS-S3 and PGS-S4 models were used. Atmospheric drag was modeled by constant and time-varying cross-sectional areas and adjustable drag coefficients. Although PGS-S4 is the best SEASAT gravity model, computed orbits show a distinct sinusoidal trend in the along-track position error component. By solving for a limited number of gravity field coefficients a modified PGS-S4M model with considerably reduced along-track errors is obtained.
Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N82-31345# Sandia Labs., Albuquerque, N. Mex. Radiant Heat Div.
SANDIA NATIONAL LABORATORIES RADIANT HEAT FACILITY
P. H. Adams, Phillip L. Class, James T. Nakos, and Bobby G. Strait Nov. 1981 83 p refs
(Contract DE-AC04-76DP-00789)
(DE82-010706; SAND-79-2182-Rev-1) Avail: NTIS HC A05/MF A01

The capabilities and limitations of the radiant heat facility are outlined. The two main types of testing equipment are described like quartz lamps and graphite resistor heater arrays. The data acquisition capabilities and instrumentation techniques are outlined, the theory of radiation heat transfer is discussed. DOE

N82-31346# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
COMPARISON OF VARIOUS SATELLITE TRACKING STATION COORDINATE SOLUTIONS
H. J. D. Piersma May 1982 29 p refs
(VTH-M-424) Avail: NTIS HC A03/MF A01

A least squares method which determines the transformation parameters required in order to relate one coordinate system to another, and a computer program which carries out the transformation between systems are described. The most important parameters are shown to be the rotation about the pole axis, which indicates the extent to which orientation differs between the two systems, and the scale factor, which reflects the differing values of the Earth gravitation parameter. Comparison of station coordinates derived from standard systems with a base set shows best agreement for PGS-S4, PGS-STR1, and PGS-L1. Author (ESA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-31347*# National Aeronautics and Space Administration, Washington, D. C.
DELTA LAUNCH OF THE TELESAT-G MISSION
24 Aug. 1982 34 p
(NASA-TM-84834; M-492-201-82-05; NAS 1.15:84834) Avail: NTIS HC A03/MF A01 CSCL 22D

Launch and deployment characteristics for the TELESAT-G (Anik-D) communications satellite are provided. N.W.

N82-31348*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
MULTI-100 KW: PLANAR LOW COST SOLAR ARRAY DEVELOPMENT Final Review Report
Jun. 1982 45 p
(Contract NAS8-32981)
(NASA-CR-162067; NAS 1.26:162067) Avail: NTIS HC A03/MF A01 CSCL 22B

The development of a 100 kW planar low cost solar array is presented. Tasks are defined, objectives are stated, and test results are given. A study of alternate contact configuration concluded that gridded back contact cells sharply reduced solar absorptance, that copper contacts will require a developmental program before interface can be achieved, and that gridded back contact cells using Ti-Pd-Ag as the contact materials appear to be the most cost-effective design. R.J.F.

N82-31349*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
MULTI-100 KW: PLANAR LOW COST SOLAR ARRAY DEVELOPMENT Final Report, 1 Sep. 1981 - 31 Jul. 1982
Jun. 1982 76 p Original contains color illustrations
(Contract NAS8-32981)
(NASA-CR-162068; LMSC-D843500; NAS 1.26:162068) Avail: NTIS HC A05/MF A01 CSCL 22B

The applicability of selected low cost options to solar array blanket design was studied by fabricating representative modules and submitting them to thermal cycle environment. Large area (5.9 x 5.9 cm) solar cells of 3 varieties were purchased: (1) Standard wraparound, (2) Copper contacts substituted for the conventional Titanium-Palladium-Silver, and (3) Standard wraparound except with gridded back contact instead of continuous metallization. The baseline cell was purchased to compare fabrication cost and to serve as a control cell during test evaluation of the other two cells. All cells were assembled into either substrate modules where the cell is individually filtered and welded to an integrated Kapton-copper circuit or into a superstrate configuration with 4 cells jointly adhered to a single sheet of microsheet and then welded to the integrated Kapton-copper circuit. Cell quality, particularly in the metallization of contacts, was less than desired. Problems were encountered with copper metallization in laying down a barrier metal which would ohmically bond to the silicon. The cells received were shunted (sintered) or with low contact pull strength (non-sintered), thus leading to the decision to solder rather than weld the copper cells to the Kapton substrate. R.J.F.

N82-31350# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RAPID PREDICTION OF THE ORBITAL LIFETIME OF SATELLITES M.S. Thesis - 1981 [PREVISAO RAPIDA DO TEMPO DE VIDA DE SATELITES]
Kondapalli Rama Rao Feb. 1982 123 p refs In PORTUGUESE; ENGLISH summary
(INPE-2330-TDL/081) Avail: NTIS HC A06/MF A01

Preliminary mission planning and analysis of satellites, the design of satellite equipment like batteries, and the planning of onboard scientific experiments, require rapid estimates of orbital lifetimes for satellites for various injection conditions. A method for rapid and reasonably accurate prediction of orbital lifetimes of satellites in the altitude range of 150 to 2000 km is presented. Small perturbation equations are used with the atmospheric drag as the chief perturbative force. It is shown that, by making a proper choice of the exospheric temperature, the CIRA-1972 atmospheric model gives very good results with enormous saving of computer time, when compared with the more detailed atmospheric description where the density is calculated as a function of local mean solar time, latitude, and other geophysical parameters. The drag coefficient was calculated using kinetic theory. For a hypothetical launch vehicle and satellite, an analysis of the effect of injection angle error on the orbital lifetime was made. Author

N82-31351# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ADAPTIVE ORBIT ESTIMATION APPLIED TO LOW ALTITUDE SATELLITES M.S. Thesis [ESTIMACAO ADAPTATIVA DE ORBITAS APLICADA A SATELITES A BAIXA ALTITUDE]
Helio Koiti Kuga Feb. 1982 121 p refs In PORTUGUESE
(INPE-2316-TDL/079) Avail: NTIS HC A06/MF A01

Estimation procedures are implemented and tested, aiming application to problems of real time orbit determination of low altitude satellites. Adaptive techniques of Dynamic Model Compensation and noise state evaluation are used in a sequential way, making the real time processing of the satellite observational data feasible. In order to test these procedures, satellite orbits and observations made by topocentric tracking stations are simulated in a digital computer. The performance of the estimation procedures is analyzed in terms of accuracy, convergence and statistical consistency, by comparison of estimated and simulated data. Author

N82-31352# Centre National d'Etudes Spatiales, Toulouse (France).
THE FUTURE OF LAUNCHERS IN EUROPE
1982 678 p refs Partly in FRENCH and ENGLISH Proc. of Intern. Conf., Paris, 19-21 Jan. 1982
Avail: NTIS HC A99/MF A01

Developments in mission type, launch vehicles, propulsion systems, aerospace technology, and reusable systems until the end of the 20th century were discussed. For individual titles, see N82-31353 through N82-31391.

N82-31353# Arianespace, Evry (France).
PROSPECTIVE STUDY OF ARIANESPACE ACTIVITY, 1986 TO 1990
B. Guillaumant *In* CNES The Future of Launchers in Europe 1982 p 9-20 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The commercial activity of Arianespace from 1986 to 1990 was studied using a computer model which estimated potential satellite market, the effect of multipayload launches, and the optimum configuration for the Ariane 4 launch vehicle. Two scenarios, i.e., 30 or 34 satellites launched, were considered. If satellites are paired for multiple launch, Ariane 4 should operate at 90% capacity. Author (ESA)

N82-31354# Centre National d'Etudes Spatiales, Paris (France).
EVOLUTION OF TRAFFIC IN LOW EARTH ORBIT
J.-C. Bouillot *In its* The Future of Launchers in Europe 1982 p 21-28 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Reasons for the increase in the number of low Earth orbit (LEO) missions in the 1980's are suggested, and the effects of this trend on launch vehicle design are discussed. Space shuttle operations, multiple launches, space rendezvous, and manned missions have LEO as at least an interim objective. In the long term, space stations will be used as relays which allow operation of space-based transfer stages. Future launch vehicles will be optimized for a large range of missions using LEO as a first destination. Author (ESA)

N82-31355# European Space Agency, Paris (France).
PERSPECTIVES FOR THE EVOLUTION OF SPACE SYSTEMS [PERSPECTIVES D'EVOLUTION DES SYSTEMES SPATIAUX]
J. A. vandenKerckhove *In* CNES The Future of Launchers in Europe 1982 p 29-35 In FRENCH (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The evolution of nonrecovery missions (geostationary satellites), space shuttle missions (multimission platforms), recovery missions (manned space stations), and special missions (nuclear waste disposal) is considered. Geostationary satellites are expected to dominate programs until at least the year 2000. Space shuttles will be used for satellite recovery, repair, or parts replacement. Economic factors rule out a European multimission platform, but space manufacturing is promising. Manned space stations are

costly, but could be used for defense purposes, such as monitoring arms treaties. Author (ESA)

N82-31356# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
FUTURE COMMUNICATION SATELLITE TRENDS AND LAUNCHER REQUIREMENTS
Dietrich E. Koelle *In* CNES The Future of Launchers in Europe 1982 p 37-42 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The trend towards larger spacecraft is discussed and the impact of large satellites on European launch vehicle design is assessed. Factors which favor large satellites include geosynchronous orbit saturation over the most populated regions, and the improving cost effectiveness of a communication space segment. For a launcher with a 5 Mg payload, a 5.5 m diameter shroud is required. Author (ESA)

N82-31357# Centre National d'Etudes Spatiales, Paris (France).
ARIANE 1 TO ARIANE 4 PROGRAM
R. Vignelles *In its* The Future of Launchers in Europe 1982 p 43-46 In FRENCH (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The history of the Ariane program is traced and ongoing programs are outlined. Ariane 3 is designed for multimission launches with a 2570 kg payload. An adapted version of Ariane 2 with 2100 kg payload capacity will also be available. Ariane 4 will be adaptable for payloads ranging from 2000 to 4300 kg. The space center in Guyana is being expanded in order to cope with more frequent launches and larger launch vehicles. Author (ESA)

N82-31358# Centre National d'Etudes Spatiales, Toulouse (France).
FUTURE MISSIONS
J. Cacheux *In its* The Future of Launchers in Europe 1982 p 47-63 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The short term outlook for space programs is assessed, given the economic recession. In low Earth orbit, Earth observation satellites in polar or heliosynchronous orbit will dominate. They will exploit passive microwave techniques for radiometry and active techniques for atmospheric sounding. The prospects for geostationary satellites are unclear. Fiber optics systems could supplant them in many sectors, and those areas where satellites present clear advantages, e.g., teleconferences, are very sensitive to economic constraints. The underutilization of satellite communication capacities is likely to continue. No significant technological advances such as large space platforms, are forecast. Efforts will be directed towards increasing power and frequency range of satellite transmission. Author (ESA)

N82-31359# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
ARIANE 5 AFTER ARIANE 4 [ARIANE 5 APRES ARIANE 4]
F. Duret *In* CNES The Future of Launchers in Europe 1982 p 67-78 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The three configurations of Ariane 5, and four missions types are described. For low Earth orbit (400 km) a two-stage launcher with 15 ton payload is planned. For orbits up to 1500 km a transfer module and attitude control system is added, with 10 ton payload. Manned flight should also be possible. A three-stage concept is proposed for geostationary orbits with 4.5 ton payloads. The HM 60 cryogenic engine will be used. Author (ESA)

N82-31360# Centre National d'Etudes Spatiales, Paris (France).
EVOLUTION OF THE ARIANE 5 CONCEPT
J. Bouchet *In its* The Future of Launchers in Europe 1982 p 79-98 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Cost reduction of the post Ariane 5 family of launch vehicles is discussed. Recovery at sea of the first stage is proposed. Apart from economic advantages over land recovery or the development of a fully recoverable (shuttle type) system, sea recovery is practical for aborted missions. Author (ESA)

N82-31361# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
PRELIMINARY PROSPECTIVE EXAMINATION OF FUTURE LAUNCH VEHICLES [PREMIERS TRAVAUX PROSPECTIFS SUR LES SYSTEMES DE LANCEMENTS FUTURS]
M. Villain *In* CNES The Future of Launchers in Europe 1982 p 99-117 In FRENCH (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Literature on two-stage launch vehicle concepts was reviewed in order to select a design for ESA use in 1995. An air breathing first stage linked to a cryogenic second stage could put a 10 ton payload into low Earth orbit, with liftcff weight of 250 tons. A rocket propelled first stage would give a liftoff weight of 400 tons, but launching is simpler. If a cryogenic rocket propellant is used, a 290 ton launcher could deliver a 10 ton payload with reusable second stage, or 15 ton payload if it is expendable. Author (ESA)

N82-31362# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
A SEMIREUSABLE LAUNCH VEHICLE CONCEPT AS A REFERENCE SYSTEM FOR REUSABILITY ANALYSES
W. Kleinau *In* CNES The Future of Launchers in Europe 1982 p 119-137 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

A two-stage concept called AR-X1, which uses H2O2 propellant and the HM 60 engine is presented. The first stage is reusable, the second expendable. The use of LH2/LOX in the first stage reduces the number of stages for geosynchronous transfer orbit (GTO) missions because of the higher performance. An 8 Mg payload can be injected in GTO (launch mass = 435 Mg). The first stage comprises four parallel stretched second stage tanks with 320 Mg propellants (total) and eight HM 60 engines arranged within the heat shield, plus one central HM 60 thruster for the soft landing maneuver. Engine performance is increased by adapting the expansion ratio to the external pressure. Trajectory calculations show that the first stage flight range is 1 500 km. Braking before touchdown is performed by retro thrust, requiring 2.5 to 3 Mg propellants. First-stage reuse reduces cost per launch by 50% compared with an expendable three stage design.
Author (ESA)

N82-31363# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
BALLISTIC OR GLIDING REUSABLE REENTRY VEHICLES [VEHICULES DE RENTREE RECUPERABLES, BALISTIQUES OU PLANANTS]
Claude Pollak *In* CNES The Future of Launchers in Europe 1982 p 147-183 In FRENCH (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Reentry problems (trajectory choice, aerodynamic heating) are reviewed and methods of investigating these are discussed. The need to improve three dimensional flow and heat flux calculation, heat shield materials (especially for gliding vehicles) and wind tunnel tests of heating is stressed. Purely ballistic reentry is too inaccurate and subjects crews to unacceptable acceleration forces, so glide or short-range trajectories are more practical. Reusable isolating and radiating heat shields and ablative ones have similar weight characteristics. Author (ESA)

N82-31364# Centre National d'Etudes Spatiales, Toulouse (France).
THE SOLARIS SYSTEM
J. J. Runavot, J. Jouffreau, A. Perret, J. Y. Prado, J. Simon, and C. Tarrieu *In its* The Future of Launchers in Europe 1982 p 185-193 In FRENCH; ENGLISH summary (For primary document

see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The Solaris design and mission capabilities are outlined. The system comprises a service module and a transport module for use with Ariane 5. The service module has a 15 yr service life, 5000 kg payload, and geostationary or heliosynchronous orbit. The transport module can deliver 4300 kg into low Earth orbit and do a return trip to heliosynchronous orbit with 2500 kg. Missions include Earth observation, material processing, ground retrieval of products, in situ satellite maintenance, and crew transfer to orbiting stations. Author (ESA)

N82-31365# European Space Operations Center, Darmstadt (West Germany).
ARIANE PERFORMANCE GAIN WITH A RESTARTABLE THIRD STAGE
W. Flury *In* CNES The Future of Launchers in Europe 1982 p 195-226 refs (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Performance gain of Ariane with a restartable third stage for geostationary, circular, elliptical, and escape missions is considered. A third stage relight capability is only of marginal interest for geostationary missions, but highly desirable for nearly any other mission type. The SPOT mission (circular orbit) performance increase would be 12%. A restartable third stage would be most beneficial for elliptical missions. Author (ESA)

N82-31366# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
RESEARCH PROGRAMS REQUIRED BY THE EVOLUTION OF CHEMICAL PROPULSION SYSTEMS
J. J. Dordain, D. Lourme, and D. Schmitt *In* CNES The Future of Launchers in Europe 1982 p 229-244 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Research required in modelling physical and chemical processes in combustion chambers, and numerical simulation of steady state and unsteady engine operation is outlined. Separate study of injection, spraying flow dynamics, and combustion is advocated. The diffusion flame model is introduced, and the advantages of microgravity research are stressed. Author (ESA)

N82-31367# Centre National d'Etudes Spatiales, Paris (France).
OPTIMIZATION CRITERIA FOR HM60 ENGINE DESIGN
Jacques Borromee *In* CNES The Future of Launchers in Europe 1982 p 245-256 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Thrust in vacuum and at sea level, combustion pressure, and differences between a staged combustion cycle (integrated flow) and a gas generator cycle (derived flow) were studied for the HM 60 engine. A 100 ton maximum derived flow engine is recommended. Author (ESA)

N82-31368# Societe Europeenne de Propulsion, Vernon (France).
STUDY OF THE HIGH THRUST LOX/LH2 HM60 ROCKET ENGINE
M. Pouliquen, Y. Berger, U. Olsson (Volvo Flygmotor-Trollhattan), and H. Kirner (MBB, Ottobrunn, West Germany) *In* CNES The Future of Launchers in Europe 1982 p 257-273 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The HM 60 engine specifications, subsystems, development program, and test facilities are described. A gas generator engine cycle with 900 kN nominal thrust in vacuum is proposed. A 100 bar chamber pressure and 2.3 m exit nozzle diameter provide 444 s specific impulse. A regeneratively cooled thrust chamber and a dump cooled nozzle with two separate turbopump assemblies fed in parallel from a single gas generator are envisaged. Author (ESA)

N82-31369# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
MISSION AND CONCEPTS OF ORBITAL PROPULSION SYSTEMS
H. Kellermeier and J. Marugan (Societe Europeenne de Propulsion, Vernon, France) *In* CNES The Future of Launchers in Europe 1982 p 275-293 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Medium thrust Earth storable bipropellant engine feasibility was studied. Representative mission types were analyzed in order to define thrust level. A mission model based on spacecraft masses in accordance with the ARIANE 3, 4 and 5 launch vehicle performance into low Earth orbit and STS masses of 5 to 25 tons was elaborated. With a constant thrust vector turn rate optimized for different accelerations and limitations for the payload loss (approx. 5 %) as well as for the burnout acceleration a thrust level between 4 kN and 12 kN covers the 67 missions investigated. Tandem and single tank configurations and feed system alternatives were examined. Engine length, performance and development cost criteria favor a 5 kN pressure-fed engine which can be uprated to a pump-fed 15 kN engine. Author (ESA)

N82-31370# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
DEFINITION OF A 5 kN ENGINE WITH THE POSSIBILITY TO INCREASE THE THRUST TO 15 kN
H. Krebs and G. Munding *In* CNES The Future of Launchers in Europe 1982 p 295-308 Sponsored by ESA (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The case for a payload propulsion module for Ariane 4, and engine thrust level selection are summarized. The development philosophy and program are outlined. The thrust chamber, injection system, and nozzle extension configuration are shown. Engine data are given. Author (ESA)

N82-31371# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. for Chemical Propulsion and Engineering.
THE OPTIMAL TRANSFER SYSTEM FOR THE ARIANE LAUNCHER FAMILY
D. Mansky *In* CNES The Future of Launchers in Europe 1982 p 309-325 refs (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Ariane 2 and 3 orbital transfer vehicle configurations were computer simulated. With the unchanged Ariane launcher and a two-burn bipropellant transfer system, higher payloads can be brought into a geostationary orbit than with a solid apogee boost or a simple apogee bipropellant boost. The payload increase possible with Az50/N2O4, depending on the Ariane type, is 15%, 8% and 7%. The percentages for LH2/LO2 are 47, 34 and 31. For the hydrogen/oxygen transfer stage a mixture ratio of 4:1 and a chamber pressure of 4 bar are needed. A tandem two tank configuration is needed because of the geometrical restrictions of the Ariane fairing. A redesigned configuration in the ARIANE 1 fairing but with a mixture ratio of 6:1 and a lower initial mass than the optimal case is shown. Author (ESA)

N82-31372# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
DEVELOPMENT OF SURFACE TENSION TANKS FOR TRANSFER SYSTEMS
G. Netter, U. Renner, and K. Eckhardt *In* CNES The Future of Launchers in Europe 1982 p 327-350 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

A surface tension tank was designed and airplane flight tested. The tank is part of a propulsion subsystem and feeds the boost motor and attitude and orbit control thrusters. It stores nitrogen tetroxide or monomethyl hydrazine plus pressurant for a long mission. An upper section, containing boost firing propellant, is emptied during unidirectional firing. The lower compartment (1/4 total tank capacity) has a propellant managing device for microgravity and zero gravity accelerations. The expulsion device

is a sump which samples propellant about to enter propellant thruster feed lines. Author (ESA)

N82-31373# Societe Europeenne de Propulsion, Vernon (France).
PUMP SUPPLY OF A LIQUID BIPROPELLANT ENGINE FOR ORBIT TRANSFER
J. R. Lehe *In* CNES The Future of Launchers in Europe 1982 p 351-359 refs In FRENCH (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Turbopump monopropellant generator, turbopump-bipropellant generator, motorpump batteries, and motorpump-turboalternator-monopropellant generator configurations were studied. The battery was big and heavy. Although the turboalternator design is heavier than the others, it has no dynamic joints between hypergolic propellants. The bipropellant design could clog the injectors. It is found that the turbopump-monopropellant design is best, in spite of a dynamic joint between hypergolic propellants. Author (ESA)

N82-31374# Societe Europeenne de Propulsion, Vernon (France).
PROPULSION SYSTEMS COMPARISON FOR GEOSTATIONARY SPACECRAFT
D. Valentian *In* CNES The Future of Launchers in Europe 1982 p 361-368 refs In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Solid and liquid apogee boost motors, and ion and hydrazine auxiliary propulsion systems are described. Propulsion system configurations which reduce overall weight are indicated. It is found that for small satellites, hydrazine orbit control thrust systems can be replaced by bipropellant systems. Bipropellant engines are attractive for large satellites. Greatest weight reductions are predicted by using ion engines. Author (ESA)

N82-31375# L'Air Liquide, Sassenage (France).
DESIGN OF LARGE CRYOGENIC FUEL TANKS FOR LAUNCH VEHICLES [LA CONCEPTION DES GRANDS RESERVOIRS CRYOGENIQUES POUR LANCEURS]
G. Rivol, L. Charleux, and C. Cande *In* CNES The Future of Launchers in Europe 1982 p 371-397 In FRENCH (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Structural and thermal analyses plans for cryogenic fuel tank design are presented. Tank geometry, dimensioning, heat flux, and pressurization are covered. The chosen cryogenic fuel tank seems very good in its responses to the task which it is to perform. However besides being a quantitative instrument it is also a qualitiative instrument which may make the difference in the choice of heavy satellite launchers. Author (ESA)

N82-31376# Contraves Corp., Zurich (Switzerland).
THE EVOLUTION OF FAIRING STRUCTURE FROM ARIANE 1 TO ARIANE 4
K. Bentz *In* CNES The Future of Launchers in Europe 1982 p 399-407 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The Ariane 4 carbon fiber composite sandwich fairing is described. Carbon fiber is preferred to Kevlar because of materials and manufacturing costs, compression strength and Kevlar's sensitivity to humidity before impregnation. The development of fiber technology allows large fiber reinforced structure elements which are used for Ariane-4 fairing structures. The core material is aluminum alloy honeycomb. A 135C curing epoxy resin matrix is used. Weight reduction for an Ariane 1 frame stringer type structure is 300 kg, which enables a payload mass to be increased by 10 kg. Author (ESA)

N82-31377# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
EVOLUTION OF TECHNOLOGIES APPLIED TO SPACE AND AERONAUTIC STRUCTURES
H. Abiven *In* CNES The Future of Launchers in Europe 1982 p 409-433 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Advanced materials in aerospace structures and their use in reusable launch vehicles are discussed. It is found that composite materials can be used for structures with temperatures up to 400 C, and for most structures with heat shielding. For structures with temperatures up to 1000 C, metals such as Norsial, based on rene alloys could be used. It is concluded that a combination of silicon and carbon composites with Aerocoat/TH hydrotranspiration heat shielding give a heat flux resistant structure with no thermal dilation problems. Author (ESA)

N82-31378# Engins Matra, Toulouse (France).
PRELIMINARY PRESENTATION OF ARIANE 5 ON BOARD ELECTRIC SYSTEM
J. Contet *In* CNES The Future of Launchers in Europe 1982 p 467-487 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Ariane 5 electric system requirements, model architecture, and navigation, data handling, and electric power assemblies are discussed. Reliability, versatility, and flexibility will be assured by a modular design using LSI circuits, with each stage being autonomous. A central computer will be linked to each stage by a bus. The second stage bus will be linked to the engine control unit. A strapdown inertial reference unit will be used. Author (ESA)

N82-31379# Sorapec, Fontenay sous Bois (France).
DEVELOPMENT OF A FUEL CELL [DEVELOPPEMENT D'UNE PILE A COMBUSTIBLE]
D. Doniat *In* CNES The Future of Launchers in Europe 1982 p 489-496 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

High power cells in Aerospace technology are discussed. Triple contact porous gas diffusion electrodes using nickel foam were developed. Depending on temperature, and quantity of catalyst (platinum based) current density varies from 0.3 to 1A/sqcm. The feasibility to obtain a power density higher than 800 mW/sq cm is investigated. Author (ESA)

N82-31380# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
HEAT SHIELD TECHNOLOGY FOR A REUSABLE BALLISTIC STAGE
H. Bassner *In* CNES The Future of Launchers in Europe 1982 p 497-513 refs (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Thermal protection technology status was reviewed, and the heat shielding of a two-stage launcher with reusable first stage having engines-first reentry was studied. Design criteria are established to evaluate the most suitable heat shield system and the heat shield mass for various heat loads. The high heat flow rates from thruster exhaust are determined by protection system size. Only ablative or water cooled structures are feasible. It is found that ablation has weight advantages, but is more expensive. Author (ESA)

N82-31381# Maschinenfabrik Augsburg-Nuernberg A.G., Nuremberg (West Germany). Aktiengesellschaft.
RECENT PROGRESS IN COMPOSITE MATERIALS APPLICATION FOR ARIANE
J. Klug and K. W. Kalk *In* CNES The Future of Launchers in Europe 1982 p 515-526 refs (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Reductions in dry mass by using carbon fiber reinforced plastics (CFRP) in launch vehicles are illustrated. The interstage structure of the Ariane second stage as CFRP and metal structure are compared. The CFRP shell comprises built up walls of inner and outer skin, covering stiffening stringers and frames. Attachment flanges are also made of CFRP. The CFRP structure mass is 157 kg, compared with 240 kg for aluminum. Author (ESA)

N82-31382# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
ADVANTAGES AND DISADVANTAGES OF REUSUABLE LAUNCH VEHICLES
D. E. Koelle *In* CNES The Future of Launchers in Europe 1982 p 529-539 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Cost reduction per launch and payload return capability of reusable launch vehicles are contrasted with higher development costs, more complex engines, need for heat shielding, and retrieval problems. The development of a semireusable vehicle, with expendable first stage is found economically most feasible. It is concluded that for the ESA Solaris project (permanent space platform) 1500 to 2000 MAU would be saved on the 15 year project. Author (ESA)

N82-31383# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
DESIGN AND OPERATIONAL REQUIREMENTS FOR A REUSABLE LAUNCH VEHICLE
J. Levod *In* CNES The Future of Launchers in Europe 1982 p 541-546 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Equipment design, system layout, and operational requirements of reusable launch vechicles are discussed. It is suggested that environmental qualification and lifetime limitations must be reconsidered for extended use of equipment and checkout and accessibility provisions must be enhanced to reduce turnaround time and cost. Spare hardware, procedures and skilled personnel must be available at the launch site for system and equipment maintenance. Author (ESA)

N82-31384# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Subdiv. Systemes.
MANNED FLIGHTS AND SAFETY
J. L. Deschanels and P. Lavedrine *In* CNES The Future of Launchers in Europe 1982 p 547-556 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The difference between reliability, fail safe, and safety is pointed out and a methodology for system safety studies for manned space flights is presented. The method defines undesirable events, traces their sources, and identifies links and barriers between events and sources, for each mission phase. Author (ESA)

N82-31385# Centre National d'Etudes Spatiales, Paris (France).
HERMES: A EUROPEAN MANNED SPACE SYSTEM
J. C. Cretenet *In its* The Future of Launchers in Europe 1982 p 559-582 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Designs for manned and automatic versions of the Hermes maneuverable reentry system are outlined. The reentry glider would go piggyback or the launcher's upper stage, with its own autonomous avionics. A round trip to low Earth orbit would take 10 days, with a touchdown in Europe or Guyana. The form would be similar to the NASA shuttle. Reentry trajectory would ensure a constant flux density of 500 kw/sqm on the nose, with thermal protection keeping structural temperature below 175C. Hydrogen oxygen fuel cells would be used for auxiliary power. A 15 kN propulsion unit with sixteen 400N attitude control engines would be mounted astern, and twelve 400N engines forward. Ariane 4 is not considered powerful enough for Hermes, except for low, circular orbits. Ariane 5 could take a 50 cu m hold automatic version, or 70 cu m manned. Author (ESA)

N82-31386# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
MAN-RATING OF A LAUNCH VEHICLE
D. Soeffker *In* CNES The Future of Launchers in Europe 1982 p 583-588 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Analysis techniques for hazard identification, classification, and control, developed for Spacelab, are presented. Hazards were classified as catastrophic (leading to crew or vehicle loss) critical (could lead to serious injury or damage) and controlled (counteracted by design). All nonmetallic materials were rated for flammability in oxygen enriched atmospheres, toxic offgassing, and odor. Any element with less than 200 mission capability was rated life limited. Author (ESA)

N82-31387# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
CONTRACT INCENTIVES
Marc Rouze *In* CNES The Future of Launchers in Europe 1982 p 597-600 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The economical and technical features in the development of aerospace programs are discussed. Methods used to achieve favorable results are: the establishment of a new type of relationship between contractural partners which entails to encite research, cost optimization and technical requirements, and the requirements of a specific organization and coherent management; incite industries to use cost optimization methods. Aerospace contract negotations are outlined, focusing on profit sharing schemes and penalty clauses. Author (ESA)

N82-31388# Centre National d'Etudes Spatiales, Paris (France).
USE OF PROGRAMMED REVIEW OF INFORMATION FOR COSTING AND EVALUATION (PRICE) MODEL AT CNES
J. B. Roux *In* CNES The Future of Launchers in Europe 1982 p 601-612 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The bases of the PRICE model, which calculates a cost-mass relation for a given project from data of thousands of other projects are outlined, and its application to the Ariane project is outlined. Ten to 20 descriptors per project define key elements, like manufacturing processes, and regression analysis calculates their coefficients and range. The model assesses physical parameters and others such as time limits. The few differences between model forecasts and actual production costs for Ariane were due to special circumstances. Author (ESA)

N82-31389# Centre National d'Etudes Spatiales, Paris (France).
ECONOMIC OPTIMIZATION OF A LAUNCH SYSTEM APPLICATION TO ARIANE 5
P. Marx *In its* The Future of Launchers in Europe 1982 p 613-627 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The influence of optimization criteria on launch vehicle staging is discussed. Ariane 5 second stage optimization, given the need to reduce payload launch costs, rather than minimize low Earth orbit performance, is considered. Reusable systems have cost disadvantages, such as high recuperation costs, which influence design. For Ariane 5 second stage, cost analysis based on propellant mass ratio, engine power, and development costs favors the smallest possible second stage compatible with mission objectives. More complex models confirm that cost and performance optimization criteria produce different designs.
Author (ESA)

N82-31390# Centre National d'Etudes Spatiales, Paris (France).
EVOLUTION OF LAUNCH SYSTEMS IN THE NEXT DECADE
M. Gilli *In its* The Future of Launchers in Europe 1982 p 631-651 In FRENCH; ENGLISH summary (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

Soviet, American, Chinese, Japanese, Indian, and Brazilian launching projects are outlined, and shuttle and conventional systems are compared. The USSR envisages a launcher capable of placing a 100 ton space station in orbit, and a shuttle service vehicle. The NASA shuttle range will be extended by adding upper stages. China plans a three stage launcher for geostationary

missions. Japan is developing low Earth orbit and geostationary orbit launchers. The Indian SLV family will be able to place 3500 kg in low Earth orbit. Brazil will develop a 150 kg payload low Earth orbit launcher. Despite the shuttle's advantages, conventional systems will continue to be economically viable. Author (ESA)

N82-31391# European Space Agency, Paris (France).
THE EUROPEAN SPACE AGENCY'S APPROACH TO FUTURE SPACE TRANSPORTATION SYSTEMS
H. A. Pfeffer *In* CNES The Future of Launchers in Europe 1982 p 653-663 (For primary document see N82-31352 22-15)
Avail: NTIS HC A99/MF A01

The 1985 ESA space transportation development program options are listed, and a general plan for long term preparatory studies is presented. The need for launchers beyond Ariane 4 is examined and a reusable launcher is recommended as a final goal. A study program to examine the implications of reusability is described. Author (ESA)

N82-31392# Naval Postgraduate School, Monterey, Calif.
PERFORMANCE OF SOLID FUEL RAMJET GUIDED PROJECTILE FOR USN 5 INCH/54 CALIBER GUN SYSTEM
Oded Amichai Mar. 1982 220 p refs
(Contract N00228-81-C-H231; DARPA Order 4035)
(AD-A115108; NPS67-82-002CR) Avail: NTIS HC A10/MF A01 CSCL 16/4

This report covers work done on performance analysis of a 5 inch, 54 caliber gun-launched guided projectile with solid fuel ramjet (SFRJ). A computer program (TRAJET) was developed. The program contains ramjet and trajectory analysis. The ramjet part considers conical shock wave losses, inlet boundary layer losses. A flat Earth trajectory with drag and thrust was considered. into combustor losses, heat losses at the combustor and nozzle losses. A flat earth trajectory with drag and thrust was considered. The various drag coefficients which were considered are: cowl drag coefficient, skin drag coefficient, wing (or fin) wave drag coefficient and wing (or fin) friction drag coefficient. The 5'/54 solid fuel ramjet has a capability to produce fuel specific impulse in the order of 400 - 900 sec. depending mostly on the flight altitude. The thrust coefficient varies in the range of 0.3 + or - 0.1 depending on the internal areas. A range in the order of 50 miles can be achieved with the ramjet operation compared to only 13 miles achieved by the conventional projectile. At low-altitude launch, a range of over 18 miles can be reached in Air-Defense Scenario. The ramjet propelled projectile reaches the ranges mentioned above at high Mach numbers (M0 1.8). GRA

N82-31393# Naval Strategic Systems Project Office, Washington, D. C.
TRIDENT 2 (D-5) STRATEGIC WEAPON SYSTEM GUIDE FOR POTENTIAL SUBCONTRACTORS Final Report
1982 86 p refs
(AD-A115379) Avail: NTIS HC A05/MF A01 CSCL 16/4

This guide will provide information to potential subcontractors (suppliers) concerning participation in the United States (U.S.) and United Kingdom (U.K.) TRIDENT II (D-5) weapon system programs. The guide will inform these subcontractors about TRIDENT II program requirements and give additional information pertinent to facilitate competitive bidding on equipment, assemblies, components, parts, and materials required for the TRIDENT II Strategic Weapon System. Author (GRA)

N82-31394# Research Triangle Inst., Research Triangle Park, N.C. Operations Analysis Div.
TORNADO MISSILE SIMULATION AND DESIGN METHODOLOGY. VOLUME 1: SIMULATION METHODOLOGY, DESIGN APPLICATIONS AND TORMIS COMPUTER CODE Final Report
L. A. Twisdale and W. L. Dunn Aug. 1981 180 p refs Sponsored by EPRI 2 Vol.
(EPRI Proj. 616-2)
(DE82-900363; EPRI-NP-2005-Vol-1) Avail: NTIS HC A09/MF A01

A probabilistic methodology was developed to predict the probabilities of tornado propelled missiles impacting and damaging nuclear power plant structures. Mathematical models of each event in the tornado missile hazard were developed and sequenced to form an integrated, time history simulation methodology. The models are data based where feasible. The data include documented records of tornado occurrence, field observations of missile transport, results of wind tunnel experiments, and missile impact tests. Probabilistic Monte Carlo techniques are used to estimate the risk probabilities. The methodology was encoded in the TORMIS computer code to facilitate numerical analysis and plant specific tornado missile probability assessments. Sensitivity analyses were performed on both the individual models and the integrated methodology, and risk was assessed for a hypothetical nuclear power plant design case study. DOE

N82-31395# Research Triangle Inst., Research Triangle Park, N.C. Operations Analysis Div.
TORNADO MISSILE SIMULATION AND DESIGN METHODOLOGY. VOLUME 2: MODEL VERIFICATION AND DATA BASE UPDATES Final Report
L. A. Twisdale, W. L. Dunn, Y. Horie, and T. L. Davis Aug. 1981 408 p refs Sponsored by EPRI 2 Vol.
(EPRI Proj. 616-2)
(DE82-900362; EPRI-NP-2005-Vol-2) Avail: NTIS HC A18/MF A01

The tornado missile hazard comprises an extreme loading condition that results from a sequence of low probability events. This sequence includes the occurrence of a severe tornado at a plant site, injection and transport of potentially damaging missiles, and high velocity missile impact on critical plant structures. Formulation and analysis of this event sequence involves detailed, mechanistic and probabilistic models of the contributing processes. The general results of data analysis and model development efforts and of the risk assessment methodology and case study analysis are summarized. DOE

N82-31396# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Space Div.
STUDY ON LAUNCHERS FOR FUTURE SPECIALIZED MISSIONS. VOLUME 1: SUMMARY REPORT
R. G. Reichert and H. T. Uebelhack Paris ESA Mar. 1981 57 p refs
(Contract ESA-4453/80/F-FC(SC))
(ESA-CR(P)-1598) Avail: NTIS HC A04/MF A01

The disposal in space of nuclear waste from Western Europe is discussed. Waste packaging, launcher systems, waste disposal destinations, reentry and impact protection systems, and safety aspects are considered. For a late 1990's mission, a ballistic recoverable, two stage orbit launch vehicle, is proposed, with waste disposed in the heliocentric orbit, at the rate of 80 (unmanned) launches per year. Reentry, and impact protection, system weighs 15,000 kg for a 7500 kg waste payload. The waste is enclosed in a glass matrix. Author (ESA)

N82-31397# National Aerospace Lab., Amsterdam (Netherlands). Space Flight Div.
HYBRID EQUATIONS FOR TRANSLATIONAL AND ROTATIONAL MOTION OF FLEXIBLE SPACECRAFT
P. T. L. M. vanWoerkom 29 Sep. 1981 77 p refs
(Contract NIVR-1910)
(NLR-TR-81116-U) Avail: NTIS HC A05/MF A01

Equations of motion of a generic spacecraft with a rigid main body, and with flexible appendages, rotors, and jets on or in the main body were obtained by hybrid coordinate modeling. The equations were linearized to obtain the motion equations of three-axis stabilized spacecraft. The reduction of the exact motion equations to those describing the motion of a multibody spacecraft, composed of rigid main body with finite moments of inertia and of point masses with zero moments of inertia, is outlined.
Author (ESA)

N82-32258# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
ENGINE SIZING AND INTEGRATION REQUIREMENTS FOR HYPERSONIC AIRBREATHING MISSILE APPLICATIONS
Paul J. Waltrup, Frederick S. Billig, and Richard D. Stockbridge *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 41 p refs (For primary document see N82-32256 22-99)
(Contract N00024-81-C-5301)
Avail: NTIS HC A12/MF A01

N82-32261# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
MULTIPLE INTAKES FOR RAMROCKETS
E.-O. Krohn and K. Triesch *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 14 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32263# Stuttgart Univ. (West Germany). Inst. fuer Raumfahrtantriebe.
RANGE MAXIMIZATION METHOD FOR RAMJET POWERED MISSILES WITH FLIGHT PATH CONSTRAINTS
Ulrich M. Schoettle *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 19 p refs Sponsored in part by the German Ministry of Defense (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32278# Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS OF COSMOS SATELLITES
A. Maksimov and B. Pokrovskiy *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 9-12 Transl. into ENGLISH from Pravda, 23 Mar. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32279# Joint Publications Research Service, Arlington, Va.
FURTHER COMMENTARY ON ACCOMPLISHMENTS OF COSMOS SATELLITES
V. Lyndin *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 13-16 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 43-44 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32285# Joint Publications Research Service, Arlington, Va.
NOTES ON COSMOS AND PROTON LAUNCHERS
I. Merkulov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 55-57 Transl. into ENGLISH from Krylya Rodiny (USSR), no. 12, Dec. 1981 p 26 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32289# Joint Publications Research Service, Arlington, Va.
SATELLITE SYSTEMS FOR MARINE RESCUE
B. Konovalov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 79-80 Transl. into ENGLISH from Izv. (USSR), 5 Feb. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32292# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES
In its USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 104-105 Transl. into ENGLISH from various Russian articles (For primary document see N82-32275 22-99)
Avail: Issuing Activity

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N82-31398*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HEMISPHERICAL LATCHING APPARATUS FOR PAYLOAD RETENTION Patent Application
Keith H. Clark, inventor (to NASA) Filed 23 Jul. 1982 18 p (NASA-Case-MFS-25837; US-Patent-Appl-SN-401282) Avail: NTIS HC A02/MF A01 CSCL 22B

An apparatus for securing payloads in a space vehicle such as the Space Shuttle is described. The apparatus includes many latching assemblies carried by a platform on the vehicle and a like number of latching elements carried by the payload and adapted to mate with the latching assemblies. The novelty of the invention is believed to reside in the use of complementary hemispherical elements which automatically align and engage with one another. This enables a simple but effective mode of operation and avoids the need for hinged linkages and similar moving parts. NASA

N82-31399*# National Aeronautics and Space Administration, Washington, D. C.
MISSION REPORT: STS-4 TEST MISSION SIMULATES OPERATIONAL FLIGHT. PRESIDENT TERMS SUCCESS GOLDEN SPIKE IN SPACE
1982 4 p
Avail: NTIS HC A02/MF A01 CSCL 22A

The fourth space shuttle flight is summarized. An onboard electrophoresis experiment is reviewed. Crew physiology, the first getaway special, a lightning survey, shuttle environment measurement, prelaunch weather conditions, loss of solid rocket boosters, modification of thermal test program, and other events are also reviewed. N.W.

N82-31400*# National Aeronautics and Space Administration, Washington, D. C.
MISSION REPORT: COLUMBIA'S SECOND MISSION - STS-2, THE FIRST FLIGHT OF A USED SPACECRAFT
1981 4 p
Avail: NASA Scientific and Technical Information Facility, P. O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The second space shuttle flight is summarized. The fuel cell problem, the robot arm test, data obtained, Earth surveys, fuel spill, tile damage, reduced shock waves, and the smooth landing are reviewed. Author

N82-31401*# National Aeronautics and Space Administration, Washington, D. C.
MISSION REPORT: STS-3 - BUSIEST AND MOST SUCCESSFUL TEST MISSION
1982 4 p
Avail: NASA Scientific and Technical Information Facility, P. O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

A postmission analysis of the STS-3 flight is presented. The change in landing plans is discussed, and the experiments performed on board are described. S.L.

N82-31402# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANALYSIS OF REPAIRABLE SPARE PARTS STOCKAGE POLICIES FOR THE SPACE SHUTTLE M.S. Thesis
Kathleen Marie Conley Jan. 1982 128 p refs
(AD-A116746; AFIT/NR-82-4T) Avail: NTIS HC A07/MF A01 CSCL 05/10

In determining policies for the acquisition and management of repairable spares for the Space Shuttle, two objectives are paramount. First is the optimization of some measure of system performance such as the expected number of shuttles launched on time per year. Second, since the cost of a spares mix can run into the hundreds of millions of dollars, we would like to minimize the cost of achieving a certain performance level. Both requirements suggest a need for mathematical models of the supply system. The high cost, low demand rate items found on the shuttle are usually controlled via an (s-l,s) inventory system. An (s-l,s) policy involves sending an item to a repair depot immediately upon failure. Using an assumed (s-l,s) repair policy, this thesis will

examine ways of choosing a spares mix according to three different mathematical models of system performance. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-31403*# Decision Science, Inc., San Diego, Calif.
TOWARD AUTONOMOUS SPACECRAFT Final Report
Lawrence J. Fogel, Philip G. Calabrese, Michael J. Walsh, and Alvin J. Owens Jun. 1982 125 p refs
(Contract NAS1-16621)
(NASA-CR-165948; NAS 1.26:165948) Avail: NTIS HC A06/MF A01 CSCL 22B

Ways in which autonomous behavior of spacecraft can be extended to treat situations wherein a closed loop control by a human may not be appropriate or even possible are explored. Predictive models that minimize mean least squared error and arbitrary cost functions are discussed. A methodology for extracting cyclic components for an arbitrary environment with respect to usual and arbitrary criteria is developed. An approach to prediction and control based on evolutionary programming is outlined. A computer program capable of predicting time series is presented. A design of a control system for a robotic dense with partially unknown physical properties is presented. Author

N82-31404*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRELIMINARY ANALYSIS OF STS-3 ENTRY FLIGHT DATA
Aug. 1982 150 p refs
(NASA-TM-81373; NAS 1.15:81373) Avail: NTIS HC A07/MF A01 CSCL 22B

The primary test objectives of STS 3 entry were to gather additional stability and control data at the higher Mach numbers and to expand the autoland operational envelope down to 200 feet. A time history of the entire entry and a list of the significant test conditions are shown. The weight, cg, and inertia characteristics used in the analyses are also shown. S.L.

N82-31405# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
ACOSS FIVE (ACTIVE CONTROL OF SPACE STRUCTURES), PHASE 1A Final Technical Report, 13 Mar. 1980 - 3 Sep. 1981
Jean N. Auburn, John A. Breakwell, Narenda K. Gupta, Michael G. Lyons, and Gabriel Margulies Mar. 1982 120 p refs
(Contract F30602-80-C-0102; ARPA Order 3654)
(AD-A116655; LMSC-D811889) Avail: NTIS HC A06/MF A01 CSCL 22/2

The theory of steady-state disturbance rejection for large space structures is developed and tested analytically on a complex optical strawman configuration (CSDL Model 2). It is shown that active control is potentially feasible for micro-vibration stabilization of precision large structures. A number of brassboard experiments have been carried out to illustrate the theory and to address implementation and mechanization of active control systems. Author (GRA)

N82-31406# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Structures Dept.
STANDARDIZATION PROGRAM ON DESIGN ANALYSIS AND TESTING OF INSERTS IN NONMETALLIC SANDWICH COMPONENTS, PHASE 1
W. H. Paul and D. Wagner Paris ESA 10 Dec. 1981 171 p refs
(Contract ESA-440/80/NL-AK(SC))
(TR-TS-RP-2-05-81; ESA-CR(P)-1585) Avail: NTIS HC A08/MF A01

In order to allow for reliable application of inserts in nonmetallic sandwich elements, the state of the art of insert technology is reviewed. Areas where further development is necessary are: load carrying capability of inserts in carbon fiber reinforced plastic sandwich loaded in plane of facing; residual strength and remaining life after passing a sequence of repeated loads; the behavior of potting resin under elevated temperatures; and the coupling between resin and facing, in order to judge insert torsion resistance. A test program which allows for verification of this analysis is presented. Author (ESA)

N82-31407# Fulmer Research Inst. Ltd., Stoke Poges (England).
GUIDELINES FOR SELECTION OF FIBRE REINFORCED COMPOSITE MATERIALS FOR SPACECRAFT APPLICATIONS
A. K. Green Paris ESA Jan. 1982 56 p 4 Vol.
(Contract ESA-4389/80/NL-AK(SC))
(R878/1A; ESA-CR(P)-1586-Vol-1) Avail: NTIS HC A04/MF A01

The properties of fiber reinforcement and matrix systems available for the fabrication of advanced composite structures are reviewed, and guidelines on the procurement of these materials are presented. Kevlar, S and S2 glass, FP alumina, boron, silicon carbide, and carbon fibers are discussed. Composite matrices covered are: epoxy, polyester and high temperature thermosetting resins; and thermoplastic and metal structures. Author (ESA)

N82-31408# Fulmer Research Inst. Ltd., Stoke Poges (England).
GUIDELINES FOR THE USE OF KEVLAR ARAMID REINFORCING FIBRES IN SPACECRAFT CONSTRUCTION
A. K. Green Paris ESA Jan. 1982 113 p refs 4 Vol.
(Contract ESA-4389/80/NL-AK(SC))
(R878/2A; ESA-CR(P)-1586-Vol-2) Avail: NTIS HC A06/MF A01

The properties and application areas for Kevlar aramid fibers are described. The manufacture and machining of Kevlar laminates are discussed, taking Kevlar 49 laminates as an example. Uses of Kevlar in spacecraft include: filament wound motor cases and pressure vessels; textile reinforced deployable structures; thermally stable composite structures; impact protection; and as a weight saving replacement of glass fiber composite parts. Industrial uses of Kevlar include the reinforcement of rubber, and in high performance cables and textiles. Author (ESA)

N82-31409# Fulmer Research Inst. Ltd., Stoke Poges (England).
GUIDELINES FOR THE USE OF SUPERPLASTIC FORMING OF METALS IN SPACECRAFT CONSTRUCTION
A. K. Green Paris ESA Jan. 1982 85 p refs 4 Vol.
(Contract ESA-4389/80/NL-AK(SC))
(R878/3A; ESA-CR(P)-1586-Vol-3) Avail: NTIS HC A05/MF A01

Aerospace uses of superplastically formed parts are reviewed, and commercial sources of superplastic materials and technology in Europe are listed. The opportunities for, and constraints on, component and structural design presented by the use of superplastic forming are outlined. The metallurgical features of superplasticity are described. Superplastic forming processes, i.e., hydraulic bulging, sheet thermoforming, blow molding, forging, deep drawing, dieless drawing, and powder metallurgy processes are discussed. Concurrent superplastic forming and diffusion bonding of titanium

alloys is introduced. Zinc-aluminum, aluminum base, and titanium alloys are treated, as are stainless steels and nickel base superalloys. Author (ESA)

N82-31410# Fulmer Research Inst. Ltd., Stoke Poges (England).
GUIDELINES FOR THE USE OF BERYLLIUM IN SPACECRAFT APPLICATIONS
D. P. Bashford Paris ESA Jan. 1982 156 p refs 4 Vol.
(Contract ESA-4389/80/NL-AK(SC))
(R878/4A; ESA-CR(P)-1586-Vol-4) Avail: NTIS HC A08/MF A01

The status of beryllium technology is reviewed, highlighting advances in beryllium powder comminution and consolidation techniques. Methods of fabricating spacecraft components for a variety of structural, optical, thermal, and instrument applications are presented, citing examples of the use of beryllium in European spacecraft. Difficulties and constraints in the designing of beryllium components are emphasized. Listings of beryllium producers and machining facilities are included. Author (ESA)

N82-31411# Centre National d'Etudes Spatiales, Toulouse (France). Dept. Stabilisation-Equipments.
REPORT ON THE STATE OF THE ART IN SPACE MECHANISMS [RAPPORT SUR L'ETAT DE L'ART DANS LE DOMAINE DES MECHANISMES SPATIAUX]
R. Salome and L. Petitjean 24 Mar. 1982 153 p refs In FRENCH
(CNES-82/CT/PRT/SST/ST/104) Avail: NTIS HC A08/MF A01

Antenna pointing, solar panel orientation, deployment, remote handling, and rendezvous and docking mechanisms are reviewed. Actuators, gears, brackets, bearings, electric signal/power transmission, shock absorbers, brakes, and position/speed indicators are considered. Author (ESA)

N82-32277# Joint Publications Research Service, Arlington, Va.
NEW FEATURES OF SALYUT-7 STATION
B. Konovalov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 6-8 Transl. into ENGLISH from Izv. (USSR), 18 May 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-31412 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
JANNAF 13TH PLUME TECHNOLOGY MEETING, VOLUME 1
Theodore M. Gilliland, ed. Apr. 1982 458 p refs Meeting held at NASA. Johnson Space Center, Houston, Tex., 27-29 Apr. 1982
(Contract N00014-81-C-5301)
(AD-E500511; CPIA-Pub-357-Vol-1) Avail: Issuing Activity CSCL 21/8

Studies on exhaust plume technology are presented. Included are papers on flow fields property measurement and prediction, electromagnetic interaction, contamination, base flow effects, radiation and gun muzzle flash. Means for the exchange of information on current research efforts, and common propulsion problems are discussed. For individual titles, see N82-31413 through N82-31442.

N82-31413 Tennessee Univ. Space Inst., Tullahoma.
PARTICLE SIZE MEASUREMENT IN SOLID PROPELLANT LAUNCH CLOUD SMOKES
W. M. Farmer, F. A. Schwartz, and K. E. Harwell *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 1-10 refs (For primary document see N82-31412 22-20)
(Contract N00174-81-C-0328)
Avail: Issuing Activity CSCL 21/8

The particle sizing interferometer (PSI) was used to measure the particle size distribution in launch smoke clouds produced by several tactical missile motors and a series of cross-linked double base developmental propellants containing various suppressants. A quartz crystal microbalance (QCM) was used to obtain the time average mass concentrations in the launch cloud and data were processed to yield geometric mean diameter, arithmetic mean diameter, volumetric mean diameter, and mass mode diameter. The time average particle number density and time average mass concentrations were determined from the PSI and QCM data. The size range of the PSI covered particle diameters less than 0.3 micro to those greater than 6.0 micro. All particles less in diameter than 0.3 micro could not be resolved but were counted. All particles greater than 6.0 micro were counted but were not resolved. E.A.K.

N82-31414* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF TRANSLATIONAL NONEQUILIBRIUM ON VACUUM PLUME EXPANSIONS
Carl S. Guernsey *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 11-17 refs (For primary document see N82-31412 22-20)
(Contract NAS7-100)
Avail: Issuing Activity CSCL 21H

The plume flowfield of a helium vent nozzle exhausting into a vacuum is defined by two techniques: the method of characteristics and the direct simulation Monte Carlo method. The method of characteristics is shown to severely underpredict gas static temperatures due to the assumption of translational equilibrium inherent in the continuum formulation. Mass flow per unit solid angle is accurately predicted for this flow field by the method of characteristics until the flow angle approaches within 10 deg of the maximum Prandtl-Meyer expansion angle. Improved treatment of the noncontinuum flow within the nozzle (near the lip) has minor effects on the accuracy of this continuum method in comparison with effects of translational nonequilibrium in the external flowfield. Possible treatment of translational nonequilibrium by the method of characteristics is discussed. E.A.K.

N82-31415* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NOZZLE LIP FLOW AND SELF-SCATTERING MOLECULAR COLLISIONS AS CONTRIBUTORS TO PLUME BACKFLOW
J. E. Chirivella (Ergo-Tech. Tujunga, Calif.), E. C. Baroth, and C. S. Guernsey *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 19-38 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

The boundary layer expansion around the nozzle lip and self scattering collisions occurring in the high density regions of the plume were investigated to determine to what extent they are responsible for the presence of material in the backflow region of a rarefied plume. To this end, advanced state of the art techniques are utilized to expand the boundary layer and to model the rarefied plume. The viscous transonic flow near the lip is calculated using the direct simulation Monte Carlo method in a version appropriate to the lip geometry. The high density region of the rarefied plume is produced by the method of characteristics, with the transonic flow at the lip rigorously patched to the supersonic flow in the plume. The MOC plume, with the lip treated by the Monte Carlo method, extents further in the backflow that the MOC plume

obtained by the replacement layer technique. The MOC results overpredict the experimental mass flux data in the backflow, while the Monte Carlo rarefied plume under-predicts them. It is found that the backflow region is mostly populated by molecules which come directly from the lip region and by main region molecules from very near the lip. A slow cross flow diffusion from the plume core main region to the back flow is detected and attributed to self scattering collisions. E.A.K.

N82-31416 Aerospace Corp., El Segundo, Calif.
AN APPLICATION OF THE MONTE CARLO METHOD TO SPACECRAFT PLUME CONTAMINATION ENVIRONMENT
Duane A. Nelson *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Mar. 1982 p 39-46 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

The direct simulation Monte Carlo method (DSMC) was used to analyze the SRM plume contamination environment of a spacecraft in terms of molecular impingement rates of heavier species at various surfaces of interest. The DSMC approach is needed to compute the expansion of the low Mach number region of the nozzle boundary layer into the surrounding vaccum. Other parts of the flow field are determined by standard continuum methods. A region of the plume where the majority of the scattered flux originates is identified. E.A.K.

N82-31417 Aerodyne Research, Inc., Bedford, Mass.
SCATTERING VISIBLE AND ULTRAVIOLET SOLAR RADIATION FROM CONDENSED ATTITUDE CONTROL JET PLUMES
C. E. Kolb, R. B. Lyons, J. B. Elgin, R. E. Huffman, D. E. Paulsen, and A. McIntyre *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 47-56 refs Prepared in cooperation with Physical Sciences, Inc., Woburn, Mass. and AFGL (For primary document see N82-31412 22-20)
(Contract F19628-78-C-0145)
Avail: Issuing Activity

Strong ultraviolet and visible radiation signals due to solar scattering from attitude control system (ACS) plumes associated with a space platform were analyzed. It is confirmed that the observed signals are caused by condensed droplets of argon, the propellant for the ACS jets. The very similar signals are predicted for equivalent ACS jets using nitrogen as a propellant. However, scattered signals for jets employing neon as a propellant are predicted to be more than two orders of magnitude smaller than those from Ar or N2 ACS jet plumes. E.A.K.

N82-31418* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PLUME BASE FLOW SIMULATION TECHNOLOGY
Barney B. Roberts, Rodney O. Wallace, and Joseph L. Sims *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 57-66 refs Prepared in cooperation with NASA. Marshall Space Flight Center (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

Plume simulation parameters were defined. Rocket exhaust simulation was determined by wind tunnel testing. It was found that cold gas testing was a cost and schedule effective data base of substantial scope. Comparisons of wind tunnel predictions with space shuttle flight data showed considerable differences. However, a review of the technology program data base has yielded an additional parameter that may correlate flight and cold gas test data. Data from the plume technology program and the NASA STS-1 and STS-2 flights are presented to substantiate the proposed simulation parameters. E.A.K.

N82-31419* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF SPACE SHUTTLE BASE HEATING METHODOLOGY AND COMPARISON WITH FLIGHT DATA
Terry F. Greenwood, Young C. Lee, Robert L. Bender (Remtech, Inc., Huntsville, Ala.), and Robert E. Carter (Lockheed Missiles and Space Co., Huntsville, Ala.) *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 67-81 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

The base heating flight data measured on the first two flights of the Space Shuttle are discussed. A complete base heating data base for STS-2 was obtained. Base heating instrumentation consisted of total calorimeters, radiometers, and some gas temperature probes. The base heating environments include both plume radiation from the SSME and SRM plumes and base convective heating due to plume flow reversal. The base heating methodology developed for Shuttle and updates of the results of these technology studies are reported and the flight data with the preflight predictions based on this methodology are compared. E.A.K.

N82-31420* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EVOLUTION OF THE WIND TUNNEL TEST PROGRAM FOR SPACE SHUTTLE ORBITER JET INTERACTION UPON ENTRY AND COMPARISON OF PREDICTIONS WITH FLIGHT TEST RESULTS
David B. Kanipe and Barney B. Roberts *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 83-94 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

Rigorous wind tunnel tests in the evolution of the Space Shuttle Orbiter's design are discussed. The interaction of the aerodynamic flow field with the exhaust plumes of the reaction control system thrusters used to augment control during entry were investigated. The history and evolution of this test program, including the selection of scaling parameters, are outlined. A comparison of preflight predictions (based on wind tunnel tests) with flight test results is included. E.A.K.

N82-31421 Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
SRM PLUME SIMULATION: FLOW FIELD OF A MACH 7.0 NITROGEN EXPANSION INTO VACUUM
J. G. Pipes, A. B. Bailey, L. L. Price, J. W. L. Lewis, R. J. Matz, and W. K. McGregor *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 95-106 refs Sponsored by AFRPL and AEDC Prepared in cooperation with Sverdrup Technology, Inc., Arnold Air Force Station, Tenn. (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

The objectives, techniques, and status of a solid rocket motor (SRM) plume simulation study are presented. The flow field of a nitrogen and a nitrogen plus aluminum oxide particle hypersonic nozzle expansion into a high vacuum are characterized. Diagnostics for temperature, density and velocity in the forward and backflow regions include electron beam fluorescence, Rayleigh and Mie scattering, impact pressure probes, and quartz crystal microbalances. The pure nitrogen flow field is discussed along with the experimental techniques. The exit plane preliminary results are compared with predictions from analytical nozzle flow codes. Predicted flow parameters are in agreement with measured values in the inviscid core flow but differ in the thick boundary layer. E.A.K.

N82-31422 Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
OPERATING CHARACTERISTICS OF AN ABLATIVE PULSED PLASMA ENGINE
R. Dawbarn, R. L. McGuire, S. L. Steely, and J. G. Pipes *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 107-113 refs Sponsored by AEDC (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

The operating characteristics of a prototype Teflon fueled pulsed plasma engine were studied. Data includes capacitor discharge currents, fuel usage rates, plasma current between the electrodes, magnetic field maps, VUV and visible spectra with both spatial and temporal resolution, high speed photographs of the plasma discharge, mass spectrometer analysis of the gases

produced by both the engine and the plasma reaction with the test chamber walls, ion gage detection of the neutral gas expansion from the engine and a time of flight quartz crystal microbalance measurement of solid material emitted in the forward flow of the engine. E.A.K.

N82-31423* Science Applications, Inc., Princeton, N.J. Propulsion Gas Dynamics Div.

DEVELOPMENT OF FULLY-COUPLED VISCOUS/INVISCID TECHNOLOGY FOR THE ANALYSIS OF EXHAUST PLUME FLOWFIELDS

S. M. Dash and D. E. Wolf *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 115-182 refs (For primary document see N82-31412 22-20)

(Contract NAS1-16535)

Avail: Issuing Activity CSCL 21H

A fully-coupled viscous/inviscid computational model under development for the analysis of exhaust plume flowfields is discussed. This model implements a zonal approach which subdivides the plume into a number of regions and treats each by optimal numerical procedures. The zonal approach resembles that used in present patched component models; however, fully-coupled technology is used to analyze and couple the various regions. Fully supersonic inviscid or viscous/inviscid regions are analyzed by the hyperbolic/parabolic SCIPVIS model, which integrates the parabolized Navier-Stokes equations and reduces to the shock-capturing SCIPPY model in the inviscid limit. Subsonic mixing regions are analyzed by a newly developed implicit model, SPLITP which implements pressure-splitting and velocity-splitting techniques for stepwise and global viscous/inviscid interactive coupling in elliptic regions. It uses an iterative implicit procedure to analyze wave processes in viscous transonic regions. The features and capabilities of SCIPVIS and SPLITP, and the approach taken to integrate them into a unified plume model are discussed. Their performance in simulating a variety of free and ducted jet mixing problems are demonstrated. Author

N82-31424* Lockheed Missiles and Space Co., Huntsville, Ala.

IMPROVED ROCKET ENGINE NOZZLE/PLUME CODE

S. D. Smith *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 183-196 refs (For primary document see N82-31412 22-20)

(Contract NAS9-16256)

Avail: Issuing Activity CSCL 21H

Additional capabilities added to the RAMP code for calculating supersonic single and multi-phase rocket exhaust plumes are described. Rocket exhaust flowfields are very complicated and are governed by many phenomena. A computer code which allows the use to eliminate many of the simplifying assumptions used to compute exhaust flows and treat most of the phenomena which govern nozzle/plume solutions is described. This code requires little or no interaction between the code and the user for the solution of a nozzle flowfield from the combustion chamber to the exhaust plume. The following capabilities have been included in the code in addition to the basic RAMP code capabilities: the rigorous nozzle boundary layer solution (BLIMPJ), the treatment of the effect of the boundary layer on particles which penetrate the nozzle boundary layer, a variable O/F transonic solution, an improved two-phase transonic solution, a treatment of the subsonic portion of the nozzle boundary layer and its effect on the exit plane properties needed to perform a plume solution; and a parabolic marching shock capturing analog to replace the characteristics approach. A status report of the code development is presented along with a description of the models and some results. J.D.

N82-31425* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A THREE-DIMENSIONAL AFTERBODY/EXHAUST PLUME NAVIER-STOKES CODE

G. S. Deiwert *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 197-206 refs (For primary document see N82-31412 22-20)

Avail: Issuing Activity CSCL 21H

Progress in the development of a three dimensional afterbody/exhaust plume Navier-Stokes code is reported. The thin shear layer formulation of the compressible Reynolds-averaged Navier-Stokes equations is solved by an implicit numerical algorithm written in vector form for a Class 6 vector processor. Bodies of revolution at moderate angles of incidence with underexpanded exhaust jets are considered for supersonic external flow fields. Turbulence closure is realized using eddy viscosity concepts. New contributions are evidenced in the treatment of fully three dimensional flow fields and in the achievement of computational efficiency through vectorization. Author

N82-31426 Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.

IGNITION OVERPRESSURE MEASURED ON STS LIFT-OFF AND CORRELATION WITH SUBSCALE MODEL TESTS

S. Lai and F. S. Laspesa *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 207-216 refs (For primary document see N82-31412 22-20)

Avail: Issuing Activity CSCL 21/8

The Space Transportation System (STS) launch vehicles and their payloads are much more complex than other launch vehicles. A comprehensive analysis of the lift-off event is required so that the responses of the vehicle and payloads can be predicted. The phenomenon of transient over-pressure induced by engine ignition has long been recognized in missiles and launch vehicle design. The pressure wave emanating from the STS solid rocket motors (SRMs) affects the entire vehicle. Therefore, ignition overpressure environment is one of the critical design factors to be assessed for lift-off. The results of ignition overpressure measured on the STS-1 flight and their correlations with the 6.4 percent scale model test data are presented. Due to the severity of the overpressure environment experienced by STS-1, a fix was developed for STS-2. The resultant overpressure measured on STS-2 is presented. The difficulties of subscale simulation for STS-2 and the discrepancies between flight test data and subscale test results are also discussed. Author

N82-31427* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SHUTTLE SRB IGNITION OVERPRESSURE: MODEL SUPPRESSION TEST PROGRAM AND FLIGHT RESULTS

N. Sam Dougherty (Rockwell International Corp., Huntsville, Ala.), Tomas E. Nesman, and Stanley H. Guest *In* JPL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 217-243 refs (For primary document see N82-31412 22-20)

Avail: Issuing Activity CSCL 21H

Higher than desired overpressure levels that occurred during the first launch of the Space Shuttle Vehicle were reduced to acceptable levels during the second launch by a combination of 'fixes' to the launch complex mobile launch platform (MLP) developed in model tests at Marshall Space Flight Center (MSFC). The fixes for STS-2 and baselined for STS-3 implemented by Kennedy Space Center (KSC) were developed and verified in a series of 6.4 percent scale model tests using a hot firing model solid rocket motor (SRM), model orbiter, external tank, and a model MLP and exhaust trench simulating the launch configuration at KSC. The model test program including screening steps leading to the final full scale suppression fix is described. The fix configuration is described for the KSC launch. Model and full scale launch data are compared and trends noted for each type of suppression technique used. Author

N82-31428 Rockwell International Corp., Downey, Calif.

SPACE SHUTTLE SMR IGNITION OVERPRESSURE PREDICTION METHODOLOGY

H. Ikawa and F. S. Laspesa *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 245-256 refs (For primary document see N82-31412 22-20)

Avail: Issuing Activity CSCL 21H

An engineering analytical methodology that can predict the ignition overpressure (IOP) propagation induced by the solid rocket

motor (SRM) starting transient during the Space Shuttle lift-off is described. It offers insight into the physical IOP generating mechanism. In this methodology, the first order IOP effects are predicted as functions of geometric configuration and of plenum chamber pressure (p sub c) history. The growth rate of wall jet along the duct trench, which is produced by the redirection of impinged rocket exhaust at the duct bottom, is postulated as the source of primary IOP wave. The wave form and frequency of the externally propagating IOP response possess an N-wave characteristic with positive and negative pressure peaks and are proportional to the p sub c. Author

N82-31429* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STUDY OF EFFECTS OF WATER ADDITION ON SUPERSONIC GAS STREAMS
John Woo, Jr. (Gamma Research, Inc.), Jess H. Jones, and Stanley H. Guest *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 257-275 refs (For primary document see N82-31412 22-20)
(Contract NAS8-34567)
Avail: Issuing Activity CSCL 21H

The experience gained from the ignition overpressure suppression system on STS-2 showed that adding large quantities of water to the solid rocket booster (SRB) exhaust hole downstream of the nozzle exit plane was very effective in suppressing the overpressure wave. The method of Shapiro and Hawthorne was applied to study the effects of water addition on the gas dynamics of subsonic gas streams in a one dimensional duct of varying cross section. Such a process can be idealized by the steady, one dimensional conservation equations for continuity, momentum, and energy of the gas mixture plus the equations of motion, mass transfer, and heat transfer for the water droplets. The results were extended to a two phase flow of water droplets, water vapor, and a 4000 R supersonic flow. Results presented to show the effect of water flow rate on the temperature, Mach number, and density of the gas stream, identify conditions for choking. It was found that when the results from the steady flow analysis are applied to the water suppression system during SRB ignition that the suppression of the overpressure wave can be partially understood in terms of the density increase of the SRB exhaust stream. J.D.

N82-31430 General Dynamics/Pomona, Calif.
CORRELATION OF LOW ALTITUDE SOLID ROCKET EXHAUST IMPINGEMENT EFFECTS
E. T. Piesik *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 277-285 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

The definition of heat transfer effects and pressure loads during low altitude, solid rocket plume impingement is analytically solvable using available plume modeling and state of the art heat transfer analysis. Comparison of data from U.S. Navy tactical missile launching with analytical calculations show engineering agreement both for temperature and pressure histories for semi-infinite flat plates at various angles and for submerged components. Various aspects of the launch phase that have first order effect on the impingement results are discussed. These are plume modeling, launcher and platform configuration, missile trajectory including gravity drop, rocket ballistics, exhaust transport properties, conduction modeling, and material properties. It is concluded that the engineering challenge is to integrate all aspects of the exhaust impingement scenario into the acceptable analytical tools required for particular design solutions. Author

N82-31431 Science Applications, Inc., Los Angeles, Calif.
PLUME CONTAMINATION EFFECTS PREDICTION FOR SEVERAL REAL SATELLITE SYSTEMS USING THE CONTAM III COMPUTER CODE
R. J. Hoffman *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 287-313 refs (For primary document see N82-31412 22-20)
(Contract F04611-78-C-0058)
Avail: Issuing Activity CSCL 21/8

Improvements to the CONTAM 3 computer model for the prediction of plume contaminant fluxes and the effect of plume species deposition on sensitive spacecraft surfaces and its application to several real satellite systems are described. Improvements to the model include: real gas effects, presentation of plume property data along user defined streamlines, improved satellite geometry descriptions and contaminant effect predictions, streamwise chemical kinetics, plume expansion (including boundary layer) into the backflow region, and applicability of CONTAM 3 to solid propellant motors. A detailed analysis of transient combustion processes and the production of contaminant species in the 10 N swirl injector bipropellant engine planned for the galileo spacecraft was conducted. The STAR 30 apogee kick motor (AKM) used on the SATCOM spacecraft was analyzed in conjunction with a plume shield designed to protect the solar array hinge and optical radiator surfaces. In a similar analysis, a solid AKM proposed for the MATRA TELCOM-1 satellite was analyzed in conjunction with a plume shield designed to protect the solar array panels. In both cases, it was necessary to predict the plume backflow to 140 deg off-axis using the CONTAM 3 model, and then to apply the results of a previous analysis using a Monte Carlo direct simulation method, scaled for these motors, to predict the molecular scatter in the wake of the plume shield. Results of these four studies are presented. In the two AKM cases analyzed, very significant plume contamination levels were predicted on the sensitive components when a plume shield was not included. With the plume shield in place, however, negligible contamination levels were predicted. J.D.

N82-31432* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC INTERACTIONS WITH TURBULENT JET EXHAUST PLUMES
Richard G. Wilmoth *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 315-330 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

The importance of aerodynamic interactions associated with external flowfield effects on turbulent jet exhaust plume structure is discussed. A viscous/inviscid prediction technique is presented which combines the overlaid mixing and inviscid plume components of the JANNAF Standardized Plume Flowfield (SPF) model with inviscid external flow and boundary layer analyses for treating nozzle afterbodies at subsonic/transonic speeds. Validation of the technique via comparisons between predictions and experiment for cold air jet plumes is presented. Predicted spatial temperature distributions for hot, nonafterburning plumes are presented and compared to results obtained from more simplified prediction techniques in order to assess the importance of the aerodynamic interactions associated with external boundary layers and pressure gradients. It is demonstrated that these interactions play a significant role in determining the near field turbulent mixing and inviscid plume shock structure. The implication of these results to plume radiation predictions is discussed. Author

N82-31433 Ballistic Research Labs., Aberdeen Proving Ground, Md. Launch and Flight Div.
A MODEL OF THE BLAST OVERPRESSURE CAUSED BY TRANSIENT EXHAUST PLUME
K. S. Fansler and E. M. Schmidt *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 331-342 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

When a gun is fired, the exhausting propellant gases form a transient, highly underexpanded plume which grows at a rate and to a size determined by the weapon muzzle exit conditions. The plume growth displaces the air external to the weapon and forms a strong blast wave which propagates in all directions away from the muzzle. The use of a scaling relationships derived from dimensional analysis which is dependent on the energy efflux rate of the propellant gases and atmospheric properties is described.

The relation is developed into a predictive scheme which well describes the blast from a wide variety of cannon. Author

N82-31434* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SIMULATION OF SOLID ROCKET STARTUP TRANSIENT FLOW USING A NUMERICAL METHOD
C. P. Li *In* APL JANNAF 13th Plume Techol. Meeting, Vol. 1 Apr. 1982 p 343-358 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

A numerical approach is used to provide detailed information and insight into the complex transients and associated overpressure produced during a solid rocket startup. The single-component flow is modeled in a two-dimensional space by the Navier-Stokes equations with eddy viscosity. The unsteady behavior of the propellant gas and air is predicted with the aid of the most sophisticated and efficient finite-difference methods currently available. Realistic initial conditions at the nozzle throat and boundary conditions on the wall and duct openings are used in the exploratory computations. The capability of the simulation code is demonstrated in the time-varying plots of flow vectors and pressure contours, and by the reasonable results obtained for inviscid as well as viscous flow models. The code was used to investigate the nature of the overpressure phenomena and the path of wave propagation emanating from the nozzle. Author

N82-31435* Martin Marietta Corp., Denver, Colo. Mechanics Dept.
IGNITION OVERPRESSURE CORRELATION FOR TITAN III 7.5% MODEL AND FLIGHT DATA
Elvis D. Simon *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 359-369 refs (For primary document see N82-31412 22-20)
(Contract NAS8-30300)
Avail: Issuing Activity CSCL 21H

The ignition overpressure data obtained from 7.5% scale Titan III tests are evaluated in terms of the overpressure pulse characteristics of magnitude, shape and propagation. Test data are compared to Titan III flight data and to analytical predictions. The analytical model for computing ignition overpressure is the Broadwell Tsu model as modified for application to Titan III. The Tomahawk motor is used for the 7.5% Titan III tests as well as for the 6.4% Space Shuttle tests. The ability of the Tomahawk motor to provide the overpressure characteristics of the full-scale solid rocket motors is evaluated. A new method for computing and correlating overpressure pulse attenuation as it propagates upward from the source is presented. Author

N82-31436* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SCALING OF IGNITION STARTUP PRESSURE TRANSIENTS IN ROCKET SYSTEMS AS APPLIED TO THE SPACE SHUTTLE OVERPRESSURE PHENOMENON
J. H. Jones *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 371-392 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21H

During startup of rocket exhaust systems, both liquid and solid, transient pressure pulses are sometimes developed. This is particularly true if the exhaust is directed into a confined volume. By linearizing the thrust buildup in the Broadwell and Tsu model and by recognizing that the positive peak overpressure is determined primarily by the pressure wave traveling up the duct, a simple non-dimensional expression for the positive peak overpressure (at the top of the duct) can be developed. The motivation for developing an expression in this fashion is its application to the Space Shuttle's launch configuration. The overpressure at the top of the duct (MLP) is radiated into free space above the Shuttle's MLP. It is this pressure wave which provides the excitation for all Shuttle system responses due to overpressure. During STS-1, high Shuttle vehicle vibration levels were produced by the overpressure wave that originated during startup of the SRB's. This necessitated a series of efforts, both analytical and experimental, which culminated in an 'overpressure fix' configuration which was successfully implemented on STS-2. Results of the 6.4% Shuttle model overpressure tests are compared to full-scale Shuttle STS-1 flight data. Author

N82-31437 McDonnell-Douglas Research Labs., St. Louis, Mo.
SWIR FROM COLLISIONALLY EXCITED CO2
J. M. Madson and J. D. Kelley *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 393-403 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

A beam-gas collision experiment to measure excitation cross sections for translation-to-vibration energy-transfer collision processes which produce short-wavelength infrared radiation (SWIR) was used to obtain the excitation cross section of CO2 number density in an integrating sphere, and infrared radiation at 4.25 microns were made to determine this excitation cross section at a collision velocity of 2.3 km/s. Author

N82-31438 TRW, Inc., Redondo Beach, Calif. Electronics and Defense.
MONTE CARLO DIRECT SIMULATION OF HIGH ALTITUDE PLUME IRRADIANCE
J. Steven Sheffield *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 405-413 refs (For primary document see N82-31412 22-20)
(Contract F04701-79-C-0025)
Avail: Issuing Activity CSCL 21/8

A procedure was developed for incorporating the collision induced rotational excitational and IR emission for water molecules into the Direct Simulation Monte Carlo method. The far-field irradiance of plume water molecules excited into IR-active states by collision with atmosphere species are traced to allow predictions of sensor readings for all angles relative to the plume axis. The procedure can be directly extended to other IR-active plume species. A comparison of the predicted plume irradiance is made with flight measurements at two altitudes for a hydrogen peroxide rocket. Good agreement is obtained for the irradiance level during the rocket pulse and the immediate decay following shutdown. Comparisons are also made with results obtained from other models and reported in the literature. The comparisons are made for both altitudes and good agreement results. Author

N82-31439 Science Applications, Inc., Colorado Springs, Colo.
THE EMP INTERACTION WITH A MISSILE AND PLUME: A COMPARISON OF THEORY AND EXPERIMENT
Mark H. Aikele (Lutech, Inc., Berkeley, Calif.) and Donald R. Stribling *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 419-429 refs (For primary document see N82-31412 22-20)
(Contract DNA001-80-C-0099)
Avail: Issuing Activity CSCL 21H

To better understand the EMP response of missiles with conducting exhaust plumes, the antenna characteristics of a small-scale rocket motor were both measured and calculated theoretically. Instrumentation was developed to measure a predictable electrical response of the motor-plume system, the input admittance. These data were then compared with those calculated theoretically by existing plume chemistry and antenna coupling codes. Results show that when the plume is sufficiently conductive in the chamber and afterburning regions the instrumentation could detect changes in the input admittance that the calculations did not predict. The reason for this appears to be incorrect modeling of capacitative coupling, especially between the nozzle and plume at the exit plane. Author

N82-31440 Aeronautical Research Associates of Princeton, Inc., N. J.
A NEW EXHAUST PLUME RADAR SIGNAL INTERFERENCE CODE
B. E. Pearce and R. W. McCullough *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 431-439 refs (For primary document see N82-31412 22-20)

(Contract N60530-81-C-0254)
Avail: Issuing Activity CSCL 21/8

A new exhaust plume RF interference prediction code designed specifically to utilize the flowfield solutions provided by the JANNAF Standard Plume Flowfield (SPF) Code was developed. Its capabilities include arbitrary locations, orientations, and velocities of the transmitter and receiver antennas and the missile. Transmission through the plume can be calculated for a straight line of sight or for a refracted ray using the geometric optics approximation. Both attenuation and phase shift by the mean flow are included. First order scattering by turbulent fluctuations of the electron density is included in attenuating and scattering the incident radiation. A unique feature is that the attenuation and phase shift of the radiation prior to and subsequent to scattering are included for straight line of sight or refracted paths. The Doppler shift, due both to the mean flow velocity and a probability distribution of the turbulent fluctuating velocity, is predicted. This code provides a unified treatment of the plume interference by the mean and fluctuating plume electrical properties that utilizes the output of the current standard flowfield code. Author

N82-31441 Spectral Sciences, Inc., Burlington, Mass.
TRANSITION FLOW EFFECTS ON ATMOSPHERIC INTERACTION, SCATTERED SOLAR AND VACUUM CORE PLUME RADIATION
J. B. Elgin *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 441-450 refs (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

A calculational comparison of a free molecular plume code (HAPAIR: High Altitude Plume-Atmosphere Interaction Radiation) and a Monte Carlo Plume Code (TRAMP: Transitional and Rarefield Axisymmetric Monte Carlo Plume) is made for a selected sequence of cases going from a free molecular to a highly transitional flow regime. Results are presented which document the breakdown of free molecular flow assumptions in the transition regime and show the effect on the critical physical processes responsible for plume emission. Author

N82-31442 Nevada Univ., Reno. School of Mines.
COMPARISON OF EXPERIMENTAL AND PREDICTED SECONDARY SMOKE OPTICAL SIGNAL ATTENUATION
Eugene Miller *In* APL JANNAF 13th Plume Technol. Meeting, Vol. 1 Apr. 1982 p 451-458 refs Sponsored by Army Research Office (For primary document see N82-31412 22-20)
Avail: Issuing Activity CSCL 21/8

A series of flight tests was conducted with a rocket loaded with 87 wt. pct. ammonium perchlorate - 1 wt. pct. aluminum-hydroxy-terminated polybutadiene binder at launch ambient conditions producing secondary and primary smoke. Laser transmission data at various wavelengths were obtained from which smoke particle volume-surface diameters and concentrations are computed by means of the Dobbins and Jizmagian method. Secondary smoke in the rocket plume is modelled using the University of Nevada's DROP 4 code with a modified LAPP plume input. Predicted number-averaged droplet diameters and concentrations agree with the experimental values within the precision of the measurements. Laser signal attenuations are predicted for several locations in the rocket plume using the University's OSA 4 code. Unequivocal comparison of the predictions with the experimental data is not possible since the location of the laser beam is uncertain, due to drifting of the plume and other experimental factors. The test transmission values for secondary smoke can be matched by the predicted values at some axial distance but not at the same distance for each test. Primary smoke transmission predictions are limited by a lack of data on the size and member distribution of the particles. Overall, however, DROP/OSA satisfactorily models smoke and optical signal attenuation in the solid rocket plume. Author

N82-31443*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF PROCESSING AND DOPANT ON RADIATION DAMAGE REMOVAL IN SILICON SOLAR CELLS
I. Weinberg, H. W. Brandhorst, Jr., C. K. Swartz, and S. Mehta (Cleveland State Univ., Ohio) 1982 15 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, England, 4-6 May, 1982; sponsored by RAE, the U.K. Dept. of Industry and ESA
(NASA-TM-82892; E-1270; NAS 1.15:82892) Avail: NTIS HC A02/MF A01 CSCL 10A

Gallium and boron doped silicon solar cells, processed by ion-implantation followed by either laser or furnace anneal were irradiated by 1 MeV electrons and their post-irradiation recovery by thermal annealing determined. During the post-irradiation anneal, gallium-doped cells prepared by both processes recovered more rapidly and exhibited none of the severe reverse annealing observed for similarly processed 2 ohm-cm boron doped cells. Ion-implanted furnace annealed 0.1 ohm-cm boron doped cells exhibited the lowest post-irradiation annealing temperatures (200 C) after irradiation to 5 x 10 to the 13th e(-)/sq cm. The drastically lowered recovery temperature is attributed to the reduced oxygen and carbon content of the 0.1 ohm-cm cells. Analysis based on defect properties and annealing kinetics indicates that further reduction in annealing temperature should be attainable with further reduction in the silicon's carbon and/or divacancy content after irradiation. Author

N82-32257# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
LOW-COST COMBUSTOR FOR A SUPERSONIC TACTICAL MISSILE
T. D. Myers and A. P. Peters *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 15 p (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32259# Stuttgart Univ. (West Germany). Inst. fuer Raumfahrtantriebe.
DESIGN CONSIDERATION AND ANALYTICAL COMPARISON OF DIFFERENT TYPES OF RAMJETS AND RAMROCKETS
Peter Benkmann and Peter A. Kramer *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 14 p refs Sponsored in part by the German Ministry of Defense (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32260# Calgary Univ. (Alberta). Dept. of Mechanical Engineering.
VALVELESS PULSEJETS AND ALLIED DEVICES FOR LOW THRUST, SUBSONIC, PROPULSION APPLICATIONS
J. A. C. Kentfield *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 11 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32266# Rolls-Royce Ltd., Bristol (England).
SERVICE EXPERIENCE WITH THREE GENERATIONS OF RAMJETS
C. F. Fletcher and D. R. Lane *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 9 p (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32267# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hardthausen (West Germany). Inst. fuer Chemische Antriebe und Verfahrenstechnik.
EXPERIMENTAL INVESTIGATION OF A HYDROCARBON SOLID FUEL RAMJET
Dirk Meinkoehn and Juergen W. Bergmann *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 11 p (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32270# Pisa Univ. (Italy). 1st. di Macchine.
DESIGN OF HYDROGEN FUELED RAMJETS AND RAMROCKETS

Dino Dini *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 5 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32272# Science Applications, Inc., Canoga Park, Calif. Combustion Science and Advanced Technology Dept.
COMBUSTOR MODELING FOR RAMJET DEVELOPMENT PROGRAMS
P. T. Harsha, R. B. Edelman, S. N. Schmotolocha, and R. J. Pederson *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 18 p refs (For primary document see N82-32256 22-99)
(Contracts F49620-80-C-0082; F33615-77-C-2062)
Avail: NTIS HC A12/MF A01

N82-32273# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
THE MATHEMATICAL MODELLING OF AIR-AUGMENTED ROCKET COMBUSTORS: A PROGRESS REPORT
J. C. Birchley, L. T. Glasspool, and A. S. Wilson *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 20 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32274# Laval Univ. (Quebec). Dept. of Mechanical Engineering.
COMBUSTOR MODELLING STUDIES FOR RAMJETS
P. Roy, A. F. Schlader, and J. Odgers *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 10 p refs Sponsored in part by the Canadian Natural Sciences and Engineering Research Council (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32286# Joint Publications Research Service, Arlington, Va.
LOW-THRUST ENGINES FOR SPACECRAFT
V. Ivanov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 58-61 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 2, Feb. 1982 p 42-43 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-31444# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
STRUCTURAL AND ACTIVITY CHARACTERIZATION OF ORGANIC MATERIALS BY ELECTROANALYSIS AND COMPUTERIZED PATTERN RECOGNITION Interim Report
W. Arthur Byers (Westinghouse Electric Corp., Pittsburgh), B. S. Freiser, and S. P. Perone (California Univ., Lawrence Livermore Lab.) May 1982 41 p Submitted for publication
(Contract N00014-75-C-0874; NR Proj. 051-552)
(AD-A116451; TR-28) Avail: NTIS HC A03/MF A01 CSCL 07/4

Pattern recognition techniques were used to characterize organic electrochemical data. Studies included compounds of three structural classes all of which were reduced in the same potential range with four electrons. It was found that both capacitive and Faradaic responses were useful in characterization of the compounds. Structural classifications could be made with 93.3% accuracy using both types of responses. Classifications of herbicidal activity could also be made for nitrodiphenylethers. Author (GRA)

N82-31445# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
MULTICOMPONENT ISOLATION AND ANALYSIS OF POLYNUCLEAR AROMATICS
B. A. Tomkins, W. H. Griest, J. E. Caton, and R. R. Reagan 1981 12 p refs Presented at the 6th Symp. on Polycyclic Aromatic Hydrocarbons, Columbus, Ohio, 27 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002903; CONF-811086-4) Avail: NTIS HC A02/MF A01

Semi-preparative scale high pressure liquid chromatography using bonded normal phase columns offers an attractive alternative to the classical solvent partition/adsorption column chromatographic procedure for obtaining polycyclic aromatic hydrocarbons or a polycyclic aromatic amines fraction of purity suitable for analysis by gas chromatography. Sample matrices ranging from fossil fuels to air particulate extracts can be fractionated successfully if the appropriate polarity column is chosen. The apparatus is low cost, gives reproducible results, does not require an expensive solvent gradient programmer, and can operate unattended. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N82-31446*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POSITRON LIFETIME STUDIES IN THERMOPLASTIC POLYIMIDE TEST SPECIMENS
Jag J. Singh, Terry L. StClair, William H. Holt, and Willis Mock, Jr. Jul. 1982 14 p refs Original contains color illustrations
(NASA-TM-84532; NAS 1.15:84532) Avail: NTIS HC A02/MF A01 CSCL 11D

Positron lifetime measurements were made in two thermoplastic polyimide materials recently developed at Langley. The long component lifetime values in polyimidesulfone samples are 847 + or - 81 Ps (dry) and 764 + or - 91 Ps (saturated). The corresponding values in LARC thermoplastic imides are 1080 + or - 139 Ps (dry) and 711 + or - 96 Ps (saturated). Clearly, the presence of moisture has greater effect on positron lifetime in LARC thermoplastic imides than in the case of polyimidesulfones. This result is consistent with the photomicrographic observations made on frozen water saturated specimens of these materials.
Author

N82-31447*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A REPAIR TECHNOLOGY PROGRAM AT NASA ON COMPOSITE MATERIALS
Jerry W. Deaton Aug. 1982 24 p refs
(NASA-TM-84505; L-15462; NAS 1.15:84505) Avail: NTIS HC A02/MF A01 CSCL 11D

Repair techniques for graphite/epoxy and graphite/polyimide composite structures are discussed. Tension and compression test results for several basic repair processes that were applied to damaged specimens are shown to approach the strength of undamaged specimens. Other repair configurations currently under investigation are illustrated, and plans in the repair technology program are presented. S.L.

N82-31448*# Douglas Aircraft Co., Inc., Long Beach, Calif.
KEVLAR/PMR-15 REDUCED DRAG DC-9 REVERSER STANG FAIRING
R. T. Kawai Aug. 1982 140 p refs
(Contract NAS3-21763)
(NASA-CR-165448; NAS 1.26:165448) Avail: NTIS HC A07/MF A01 CSCL 11D

A reduced drag fairing for the afterbody enclosing the thrust reverser actuators on the DC-9 has been developed with Kevlar-49/PMR-15 advanced composite material. The improved fairing reduces airplane drag 1% compared to the production baseline. Use of composites reduces weight 40% compared to an equivalent metal fairing. The Kevlar-49/PMR-15 advanced composite is an organic matrix material system that can be used at temperatures up to 500 F. Author

N82-31449*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENVIRONMENTAL AND HIGH-STRAIN RATE EFFECTS ON COMPOSITES FOR ENGINE APPLICATIONS
C. C. Chamis and G. T. Smith 1982 20 p refs Presented at the 23rd Struct. Dyn. and Mater. Conf., New Orleans, 10-12 May 1982; sponsored by AIAA, ASME, ASCE, and AHS Previously announced in IAA as A82-30118
(NASA-TM-82882; NAS 1.15:82882) Avail: NTIS HC A02/MF A01 CSCL 11D

The Lewis Research Center is conducting a series of programs intended to investigate and develop the application of composite materials to structural components for turbojet engines. A significant part of that effort is directed to establishing resistance, defect growth, and strain rate characteristics of composite materials over the wide range of environmental and load conditions found in commercial turbojet engine operations. Both analytical and experimental efforts are involved. Author

N82-31450*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PIEZOELECTRIC COMPOSITE MATERIALS Patent Application
L. J. Kiraly, inventor (to NASA) Filed 12 Jul. 1982 9 p
(NASA-Case-LEW-12582-1; US-Patent-Appl-SN-397281) Avail: NTIS HC A02/MF A01 CSCL 11D

A laminated structural device that has the ability to change shape, position and resonant frequency without using discrete motive components is described. The laminate may be a combination of layers of a piezoelectrically active, non-conductive matrix material. A power source selectively places various levels of charge an electrically conductive filaments imbedded in the respective layers to produce various configurations in a predetermined manner. The layers may be electrically conductive, having imbedded piezoelectrically active filaments. A combination of layers of electrically conductive material may be laminated to layers of piezoelectrically active material. NASA

N82-31451*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERFACE CONTROL AND MECHANICAL PROPERTY IMPROVEMENTS IN SILICON CARBIDE/TITANIUM COMPOSITES
William D. Brewer and Jalaiah Unnam (Virginia Polytechnic Inst. and State Univ.) Aug. 1982 22 p refs
(NASA-TP-2066; L-15381; NAS 1.60:2066) Avail: NTIS HC A02/MF A01 CSCL 11D

Several composite systems made of titanium matrix reinforced with silicon carbide fiber were investigated to obtain a better understanding of composite-degradation mechanisms and to develop techniques to minimize loss of mechanical properties during fabrication and in service. Emphasis was on interface control by fiber or matrix coatings. X-ray diffraction studies on planar samples showed that the formation of titanium silicides was greatly inhibited by the presence of aluminum or Ti3Al layers at the fiber-matrix interface, with the Ti3Al being more effective in reducing the reactions. Fiber studies showed that coating the fiber with a 1-micron-thick layer of aluminum improved the as-fabricated strength of a stoichiometric SiC fiber and reduced the fiber degradation during exposure to composite-fabrication conditions. Applying an interfacial barrier by coating the matrix foils instead of the fibers was found to be an effective method for improving composite strength. Reducing the fabrication temperature also resulted in significant improvements in composite strengths. Good-quality, well-consolidated composites were fabricated at temperatures well below those currently used for SiC-Ti composite fabrication. Author

N82-31452# Lockheed-California Co., Burbank.
ADVANCED RESIDUAL STRENGTH DEGRADATION RATE MODELING FOR ADVANCED COMPOSITE STRUCTURES. VOLUME 1: TASK 1. PRELIMINARY SCREENING Final Report, 1 Aug. 1977 - 21 Jun. 1979
D. E. Pettit, K. N. Lauraitis, and J. M. Cox Wright-Patterson AFB, Ohio AFWAL Jul. 1981 323 p refs 3 Vol.
(Contract F33615-77-C-3084; AF Proj. 2401)
(AD-A115183; LR-28360-10-Vol-1; AFWAL-TR-79-3095-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 11/4

This report presents the results of the first task of a three task program directed at the study of relationship between damage propagation and residual static strength of composite laminates. In Task 1: Preliminary screening, two laminates a 24-Ply 67% 0 deg. fiber and a 32-Ply quasi-isotropic laminate of T300/5208 graphite epoxy material were selected for study. Two damage types were studied, a low velocity impact condition (i.e., simulated tool drop) and a badly drilled hole. An initial study was conducted for each damage type to determine the detailed damage introduction parameters resulting in the selection of one set of impact and one set of poor drilling conditions. Baseline static tension and static compression tests were conducted on each of the four damage/laminate conditions. Stress vs life (S-N) fatigue data were then generated at range ratio R=-1 for each of the four conditions. The damage growth characteristics were monitored on each fatigue specimen using a modified Holscan ultrasonic unit. A subset of the damaged hole specimens was also evaluated in static compression and fatigue (R = -1) using TBE enhanced X-ray methods to monitor damage growth and to assess any detrimental effect of TBE on subsequent behavior of the damage. The results indicate significant reduction in initial static tension and compression strengths for the damaged hole condition in both laminates. Author (GRA)

N82-31453# Lockheed-California Co., Burbank.
ADVANCED RESIDUAL STRENGTH DEGRADATION RATE MODELING FOR ADVANCED COMPOSITE STRUCTURES. VOLUME 2: TASK 2 AND 3 Final Report, 1 Jul. 1979 - 29 May 1981
K. N. Lauraitis, J. T. Ryder, and D. E. Pettit Wright-Patterson AFB, Ohio AFWAL Jul. 1981 324 p refs 3 Vol.
(Contract F33615-77-C-3084; AF Proj. 2401)
(AD-A115184; LR-28360-19-Vol-2; AFWAL-TR-79-3095-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 11/4

Contents: Overview of Tasks II and III; Material and Specimen Characterization -- Tasks II and III; Experimental Procedures; Static Tension and Compression Results; Task II Fatigue Results; Task III Fatigue Results; Damage Characterization; and Analysis of Results. GRA

N82-31454# Army Materials and Mechanics Research Center, Watertown, Mass.
INFLUENCE OF COMPOSITION AND PROCESS SELECTION ON DENSIFICATION OF SILICON NITRIDE Final Report
George E. Gazza May 1982 19 p refs Presented at NATO Advan. Study Inst. on Nitrogen Ceram., Falmer, England, 27 Jul. - 7 Aug. 1981
(DA Proj. 1L1-62105-AH-84)
(AD-A116652; AMMRC-TR-82-32) Avail: NTIS HC A02/MF A01 CSCL 07/1

In the development of fully dense silicon nitride, both compositional selection and microstructural control are taken into consideration to maximize resultant properties. The effect of impurities and phase behavior on high temperature properties depends on the silicon nitride-additive compositional selection. Both strength and fracture toughness within a given compositional system can be improved by process control of the microstructure, i.e., grain size and morphology. Dual pressure processing of silicon nitride-yttria-alumina materials can be used to sinter these materials to near theoretical density. Author (GRA)

N82-31455# Dayton Univ., Ohio.
LOCAL LEADING EDGE DAMAGE FROM HARD PARTICLE AND SOFT BODY IMPACTS, TASK IVB Interim Report, 1 Jan. 1979 - 1 Dec. 1980
Robert S. Bertke Wright-Patterson AFB, Ohio AFWAL May 1982 106 p refs
(Contract F33615-77-C-5221; AF Proj. 3066)
(AD-A116671; UDR-TR-81-20; AFWAL-TR-82-2044) Avail: NTIS

CSCL 11/4

This report describes a study to experimentally determine the leading edge local response of typical blade materials to impact loading and derive analytical/empirical models of the response. The three fan blade type materials investigated were the J79 blade material of 403 stainless steel, the F101 blade material of 8Al-1Mo-IV (8-1-1) titanium and the APSI metal matrix blade material of boron/aluminum. The local leading edge damage problem was investigated on the three materials using glass beads, steel spheres, granite pebbles, ice, and artificial birds as the impactors. The resulting specimen damage for each impactor type and size was characterized by identifying the damage mode and quantifying the damage by making various damage measurements. GRA

N82-31456# General Electric Co., Schenectady, N. Y.
SINTERED Si3N4 FOR HIGH PERFORMANCE THERMOMECHANICAL APPLICATIONS Final Report, 1 Jan. 1981 - 1 Jan. 1982
W. D. Pasco and C. D. Greskovich Apr. 1982 62 p refs
(Contracts DAAG46-81-C-0029; EC-76-A-1017-002)
(AD-A116121; SRD-82-045; AMMRC-TR-82-22) Avail: NTIS HC A04/MF A01 CSCL 13/8

The gas pressure sintering (GPS) process for dense (< 99%) Si3N4 containing approx. 7 wt% BeSiN2 and 7 wt% SiO2 as sintering aids was scaled-up to develop a property data base for use in thermomechanical applications at high (approx. 1300 deg C) temperatures. The fracture strength in 3-pt bend for test bars approx. 0.6 cm x 0.6 cm x 4.5 cm long was approx. 440 MNm-2 (63,700 psi) for a span length of 3.8 cm. There was little drop (< 15%) in high temperature strength at 1400 deg C in air. The creep resistance was outstanding at 1300 to 1400 deg C, as evidenced by creep rates of approx. 4 x .00001/h for a stress of 207 MPa (30,000 psi) at 1400 C. Author (GRA)

N82-31457# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
INSTRUCTIONS FOR TI-59 COMBINED CARD/MODULE CALCULATIONS FOR IN-PLANE PROPERTIES OF SYMMETRIC HYBRID LAMINATES Final Report, Sep. - Nov. 1981
Stella D. Gates Mar. 1982 43 p refs
(AD-A116654; AFWAL-TR-81-4183) Avail: NTIS HC A03/MF A01 CSCL 11/4

This report contains the description and instructions for the combined use of composite materials module and magnetic cards for TI-59 programmable calculators. These programs contain the key calculations of the stiffness and strength of unidirectional, and laminated hybrid composites under in-plane loading. This can include sandwich core laminates. With the combination of the module and magnetic cards, instant calculations can be made for practical use. With the use of a printer, these can be immediately outputted and recorded permanently. The formulas used in the cards and equation numbers have been derived in a book entitled, Introduction to Composite Materials, co-authored by S. W. Tsai and H. T. Hahn, published by Technmic Publishing Company, Westport, Connecticut, July 1980. Author (GRA)

N82-31458# Lulea Univ. (Sweden). Div. of Soil Mechanics.
SWELLING PRESSURE OF HIGHLY COMPACTED BENTONITE
Roland Pusch Aug. 1980 34 p refs
(SKBF/KBS-TR-80-13) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Highly compacted, dense sodium bentonite is used to isolate metal canisters containing highly radioactivity waste products from the surrounding rock. The relationship between the swelling pressure and bulk density of bentonite was investigated with special reference to the influence of ion exchange and temperature. A new type of oedometer for swelling pressure tests was developed. It was found that there seemed to be unique relationship between the bulk density and the pressure, and that a temperature increase to 70 C reduced the pressure to approximately 50% of the value at 20 C. It was observed that the pore water chemistry was not a determinant of the swelling pressure in the bulk density above 2 t/cu m. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N82-31459*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN FLEXIBILITY OF REDOX FLOW SYSTEMS
Norman H. Hagedorn and Lawrence H. Thaller 1982 18 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug. 1982
(Contract DE-AI04-80AL-12726)
(NASA-TM-82854; E-1223; NAS 1.15:82854;
DOE/NASA/12726-16) Avail: NTIS HC A02/MF A01 CSCL 10C

The characteristics inherent in Redox flow systems permit considerable latitude in designing systems for specific storage applications. The first of these characteristics is the absence of plating/deplating reactions with their attendant morphology changes at the electrodes. This permits a given Redox system to operate over a wide range of depths of discharge and charge/discharge rates. The second characteristic is the separation of power generating components (stacks) from the energy storage components (tanks). This results in cost effective system design, ease of system growth via modularization, and freedom from sizing restraints so that the whole spectrum of applications, from utilities down to single residence can be considered. The final characteristic is the commonality of the reactant fluids which assures that all cells at all times are receiving reactants at the same state of charge. Since no cell can be out of balance with respect to any other cell, it is possible for some cells to be charged while others are discharging, in effect creating a DC to DC transformer. It is also possible for various groups of cells to be connected to separate loads, thus supplying a range of output voltages. Also, trim cells can be used to maintain constant bus voltage as the load is changed or as the depth of discharge increases. The commonality of reactant fluids also permits any corrective measures such as rebalancing to occur at the system level instead of at the single cell level. S.L.

N82-31460# Geo-Centers, Inc., Newton, Mass.
THE COMBUSTION OF ALTERNATE FUEL SYSTEMS SHOCK TUBE STUDIES OF THE DECOMPOSITION OF ORGANIC MOLECULES Final Report
Feb. 1982 17 p refs
(Contract N00014-80-C-0462)
(AD-A112597; GC-TR-82-165) Avail: NTIS HC A02/MF A01 CSCL 20/5

This report summarizes a series of shock tube experiments. During this time period, a CO laser was calibrated for the purpose of monitoring CO formation rates during the decomposition of several organic molecules. The compounds investigated were formic acid (HCOOH), formaldehyde (HCHO), ketene (CH2CO), and cyclobutanone (C4H6O). The decomposition data are under analysis. GRA

N82-31461# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
AN AUTOMATED HANGING MERCURY DROP ELECTRODE Interim Report
W. Arthur Byers (Westinghouse Electric Corp., Pittsburgh) and S. P. Perone (California Univ., Lawrence Livermore Lab.) May 1982 9 p refs Submitted for publication
(Contract N00014-75-C-0874; NR Proj. 051-552)
(AD-A116433; TR-26) Avail: NTIS HC A02/MF A01 CSCL 07/4

This paper describes the construction of an automated static mercury drop electrode dispenser. It can be constructed from readily available materials, requires little maintenance, is easy to fill, and dispenses very reproducibly. Author (GRA)

N82-31462# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
INSTRUMENTATION AND METHODOLOGY FOR GENERATION OF AN ELECTROCHEMICAL DATA BASE FOR PATTERN RECOGNITION Interim Report
W. Arthur Byers (Westinghouse Electric Corp., Pittsburgh) and S. P. Perone (California Univ., Lawrence Livermore Lab.) May 1982 41 p refs Submitted for publication
(Contract N00014-75-C-9874; NR Proj. 051-552)
(AD-A116450; TR-27) Avail: NTIS HC A03/MF A01 CSCL 07/4

Instrumentation and methods are presented for determining the Faradaic and capacitive responses of an analytic over a wide range of experimental conditions. Experiments were carried out by a fractional factorial design so that the best experimental conditions or changes in conditions for analytic identification could be determined in a later pattern recognition analysis. Percent ethanol, pH, surfactant concentration, number of cycles, scan rate, and mercury drop hang time all produced changes in cyclic differential capacity curves and cyclic staircase voltammograms which were unique and reproducible. Capacitive and Faradaic responses were determined independently for 19 nitrocompounds under most experimental conditions. Author (GRA)

N82-31463# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Werkstofftechnologie and Chemie.
FILTRATION TECHNIQUES FOR REVERSED OSMOSIS
K. H. Reinhardt and H. J. Mueller 1980 32 p refs In GERMAN
(DE82-902292; GKSS-80/E-37) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Filtration techniques for reverse osmosis pretreatment systems and methods for mathematical modeling and testing of filters as well as for determining concentration and particle size distribution of suspended solids are reviewed. The sensitivity of turbidity measurements can be increased by compensating for stray light which originates from the cuvette walls so that very low contents of suspended solids can be measured as accurately as by the silt density index method. The latter, however, is better suited for predicting membrane behavior. DOE

N82-31464# Cornell Univ., Ithaca, N. Y.
PYROLYSIS OF COAL-DERIVED FUELS USING THE LASER-POWERED HOMOGENEOUS PYROLYSIS TECHNIQUE Quarterly Technical Progress Report, 1 Aug. - 31 Oct. 1981
P. C. T. deBoer 31 Oct. 1981 13 p
(Contract DE-FG22-80PC-30217)
(DE82-007465; DOE/PC-30217/T3) Avail: NTIS HC A02/MF A01

A graphical computer program was written to calculate results for isotherms, lines of equal vorticity, lines of constant streamfunction and velocity vectors. A second computer program was written which incorporates the Boussinesq equations instead of the equations of motion for a strongly heated gas. Additional measurements were made of the unimolecular decomposition of 1-chloropropane to propene and hydrogen chloride. DOE

N82-31465# Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
ROLE OF TEMPERATURE, SOLVENT, AND AGITATION IN COAL DISSOLUTION AND LIQUEFACTION Quarterly Report, Sep. - Nov. 1981
D. E. Briggs and Sina Ebnesajjad Dec. 1981 45 p refs
(Contract DE-FG22-81PC-40811)
(DE82-000015; DOE/PC-40811/1) Avail: NTIS HC A03/MF A01

The role of temperature, solvent character and agitation in the dissolution and liquefaction of bituminous coal was studied. If any of the coal is peptized or dissolved at 3400 C, it becomes pyridine insoluble upon cooling. Few or no chemical bonds are broken. Up to 90% of the DMMF coal becomes pyridine soluble when heated to 4000 C in the given solvent mixture. A minimum rotation rate is required to keep the coal particles suspended with the propeller/impeller. Below the rotation rate, some coal particles settle to the bottom of the reactor and pyrolyze causing unusually high gas formation and the appearance of exothermic peaks in the temperature profile. Dissolution yield remains unchanged when rotation rate is increased beyond the value required for complete suspension of coal particles and adequate heat transfer at the reactor surfaces. The onset temperature of dissolution of Kentucky No. 9 coal lies in the range of 355 to 3750 C. It is marked by the onset of gas formation. While dissolution is rapid at 4000 C, it does not occur to any appreciable extent at temperatures below 3700 C. DOE

N82-31466# Auburn Univ., Ala. Coal Conversion Lab.
STUDIES IN COAL LIQUEFACTION WITH APPLICATION TO THE SRC AND RELATED PROCESSES Quarterly Report, Nov. 1980 - Jan. 1981
James A. Guin and Christine W. Curtis 1981 83 p refs
(Contract DE-AC22-79ET-13397)
(DE82-010868; DOE/ET-13397/9; FE-3397-9) Avail: NTIS HC A05/MF A01

The nature and importance of gas-liquid mass transfer in coal liquefaction is assessed. Different processes in coal liquefaction were studied. A method for ascertaining and eliminating locally unenhanced regions in a stirred vessel using gas absorption with chemical reaction is discussed. Gas-Liquid mass transfer was found to be important to the quality of liquids made from coal. The reduction of the iron sulfates, szmolnokite and coquimbite, to pyrrhotite during coal liquefaction is examined. The effect of temperature, gas, and solvent type on the evolution of a known coal particle size distribution during liquefaction is discussed. The particle size distribution changes in various ways depending on the process conditions, as the particles dissolve. The nature of rhodium dispersed on an Al2O3 support as determined by IR is reported. This system (Rh-Co-Al2O3) was used to calibrate a vacuum adsorption/IR apparatus which is utilized to study coal liquefaction sorbate molecules on coal mineral catalysts, in conjunction with their reactivity. DOE

N82-31467# Pittsburg and Midway Coal Mining Co., Englewood, Colo.
SOLVENT-REFINED-COAL (SRC) PROCESS. REPORT ON THE SRC-2 PROCESS COST MODEL. A. SRC-2 PROCESS COST MODEL. B. COMPARISON OF THE 11% TO 16% ASH COALS USING THE SRC-2 PROCESS COST MODEL Interim Report
T. Hand Feb. 1982 109 p refs
(Contract DE-AC05-76ET-10104)
(DE82-010423; DOE/ET-10104/30; RDR-53; IR-53) Avail: NTIS HC A06/MF A01

The SRC-II Process Cost Model was used to quantify the advantage of higher yields of fuel products into economic terms for a commercial-sized SRC-II plant. The study consists of two parts: part 1, SRC-II process cost model, and part 2, Comparison of 11% to 16% Ash Coals Using the SRC-II process cost model. Part 1 describes the cost model itself, which evaluates the comparative economics of process alternatives planning for future R and D efforts under the SRC-II program. The model is a computerized economic model of the SRC-II commercial process. It is a modular, flow oriented model that estimates the capital investment, operating costs, and product slate for the SRC-II process as a function of the process design. Part 2 describes a comparative economic study using the SRC-II process cost model to quantify the benefits of cleaning Ireland coal to an 11% ash content versus a 16% ash content. The 11% ash coal gives higher yields of fuel products than the 16% ash coal when fed to the SRC-II process development unit P-99. DOE

N82-31468# Pittsburg and Midway Coal Mining Co., Englewood, Colo.
SOLVENT-REFINED-COAL (SRC) PROCESS. EFFECT OF COAL PROPERTIES ON SRC-2 YIELDS AND RELATION TO COAL REACTIVITY. VOL. 5: RESEARCH AND DEVELOPMENT TECHNICAL SUPPORT PROGRAM, PART 3, MODELING AND

SIMULATION Interim Report
G. L. Jones Feb. 1982 34 p refs
(Contract DE-AC05-76ET-10104)
(DE82-010767; DOE/ET-10104/24; RDR-53; IR-47) Avail: NTIS HC A03/MF A01

Yield correlation models including process variables and coal properties were developed by regression of SRC pilot unit data. Models using process variables were derived from 145 runs on three pilot units. Coal property submodels were determined from a set of 45 process development unit P-99 runs in terms of a series of linear coal property terms. The complete yield models were then the sum of the process variable and coal property submodels. By separate analysis, Kentucky and Powhatan coals in the larger data base of 145 runs were ranked by the relative magnitudes of the coal correction term in the total liquid and SRC yield models, with the coal taken into account as a class variable which accounts for each coal source. Individual variables from three broad classifications emerge as most important. These are catalytic variables, particularly iron in ash; a proximate analysis variable, particularly hydrogen to carbon ratio; and a maceral analysis variable such as maximum mean reflectance of vitrinite or total reactive macerals. DOE

N82-31469# Pittsburg and Midway Coal Mining Co., Englewood, Colo.
SOLVENT-REFINED-COAL (SRC) PROCESS: PREPILOT SRC-2 DEVELOPMENT PROJECT FEED COAL EFFECTS ON KINETICS TASK. VOL. 5: RESEARCH AND DEVELOPMENT TECHNICAL SUPPORT PROGRAMS, PART 2, PREPILOT STUDIES
N. L. Carr, M. E. Prudich, and W. G. Moon Feb. 1982 113 p refs
(Contracts DE-AC05-76ET-10104; DE-AC05-79ET-10104)
(DE82-007759; DOE/ET-10104/23; RDR-53; IR-46) Avail: NTIS HC A06/MF A01

The processing of two different coals and a binary mixture thereof are discussed, as well as the kinetics of coal liquefaction. The two coals included an Ireland mine (high reactivity) coal and a Blacksville mine (low reactivity) coal. Feed coal type was found to have a definite effect on the process kinetics with the Ireland coal being extremely sensitive to changes in the operating variables and Blacksville coal behaving in an almost invariant manner. It was determinted that the effect of blending feed coals at constant processing conditions can be characterized by a simple, unweighted, linear averaging rule. Model were developed to correlate the yield responses with the variables which were examined. DOE

N82-31470# Bradford Univ. (England). Dept. of Chemical Engineering.
BEHAVIOR OF FINE PARTICLES IN A FLUIDIZED BED OF COARSE SOLIDS Final Report
D. Geldart Oct. 1981 182 p refs Sponsored by EPRI
(EPRI Proj. 839-1)
(DE82-900965; EPRI-CS-2094) Avail: NTIS HC A09/MF A01

The residence time of carbon particles in a fluidized bed is a major factor determining combustion efficiency. Particles carried out of the system incompletely burnt in the flue gases are in the size range 100 to 400 microns. Carryover rates, the concentration of solids in the freeboard, bed density profiles, and solids mixing characteristics were measured. A vertical concentration gradient of fines was found which exists throughout the bed and depends on both the relative and absolute size of fines and coarse. Fines and coarse interact in the freeboard; the larger the carryover flux of fines the greater the height to which coarse particles are carried. Bed density decreased with increasing distance above the distributor, and tubes in the bed modified the density profile significantly; under certain circumstances two separate fluidized beds were formed. Correlations are presented which allow carryover rates and particle residence times to be calculated as a function of gas and particle properties. DOE

N82-31471# California Univ., Livermore. Lawrence Livermore Lab.
TRIAL MANUFACTURE OF A MERCURY ION-SELECTIVE ELECTRODE AND ITS APPLICATION TO MICROANALYSIS OF ORGANIC MERCURIDES
W. Changyi 1981 13 p refs Transl. into ENGLISH from Kao Ten Hsueh Hsiao Hua Hsueh Pao (China), v. 2, no. 3, 1981 13 p
(Contract W-7405-eng-48)
(DE82-000924; UCRL-Trans-11725) Avail: NTIS HC A02/MF A01

An oxygen flask decomposition mercury ion selective electrode method was proposed for microanalysis of mercury in organic mercurides. The proposed method is simple and rapid and has a sharp end point. Absolute error is + or - 0.3%. Nitrogen, fluorine, sulfur, phosphorus, boron, silicon, potassium, and sodium present in compounds do not interfere with the determinations. DOE

N82-31472# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
THERMODYNAMICS AND KINETICS OF PHASE SEPARATION
D. deFontaine Jun. 1981 23 p refs Presented at the TMS/ASM/USA/China Bilateral Metallurgy Conf., Beijing, China, Nov. 1981
(Contract W-7405-eng-48)
(DE81-025325; LBL-12865; CONF-811107-1) Avail: NTIS HC A02/MF A01

The art of the physical metallurgist is the control of properties through microstructure. Microstructure, in turn, is controlled by bringing about certain phase changes, usually carried out far from thermodynamic equilibrium. Of central practical importance, then, are temperature-time-transformation (TTT) diagrams. Such diagrams determined experimentally, indicate to the alloy designer, after how long (t = time) as isothermal heat treatment (T = temperature) will yield a given new phase beta (or mixture of phases) from a parent alpha phase, stable above the thermodynamic alpha yields beta equilibrium temperature. Two T-vs.-log t curves are usually plotted: one (full line) which indicates the start of the transformation when, say 1% of alpha has transformed, and an end curve (dashed line) when, say 99% of alpha has transformed. Considerable use is made of TTT diagrams in the heat treating of steels. DOE

N82-31473# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Actinide Technology Div.
THORIUM OXALATE SOLUBILITY AND MORPHOLOGY
P. R. Monson, Jr. and R. Hall Oct. 1981 15 p refs
(Contract DE-AC09-76SR-00001)
(DE82-001760; DP-1576) Avail: NTIS HC A02/MF A01

Thorium was used as a stand-in for studying the solubility and precipitation of neptunium and plutonium oxalates. Thorium oxalate solubility was determined over a range of 0.001 to 10.0 in the concentration parameter [H2C2O4]/sq [HNO3]. Morphology of thorium oxide made from the oxalate precipitates was characterized by scanning electron microscopy. The different morphologies found for oxalate-lean and oxalate-rich precipitations were in agreement with predictions based on precipitational theory. DOE

N82-31474# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
GATLINBURG CONFERENCE: BAROMETER OF PROGRESS IN ANALYTICAL CHEMISTRY
W. D. Shults 1981 9 p Presented at the 25th Conf. on Anal. Chem. and Nucl. Technol., Gatlinburg, Tenn., 6 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002906; CONF-811025-22) Avail: NTIS HC A02/MF A01

The close correlation between program content of past Gatlinburg AEC-ERDA-DOE conferences and developments in the methodology of analytical chemistry is outlined. DOE

N82-31475# Los Alamos Scientific Lab., N. Mex.
POLYIMIDE AND POLYAMIDE-IMIDE IN A TRITIUM ATMOSPHERE
K. F. Wylie, J. E. Hockett, and T. L. Buxton 1981 16 p refs Presented at the 9th Ann. DOE Compatibility Conf., St. Petersburg, Fla., 27-29 Oct. 1981
(Contract W-7405-eng-36)

(DE82-002376; LA-UR-81-3093; CONF-811076-2) Avail: NTIS HC A02/MF A01

Five different commercial polyamide imide and polyimide specimens were kept in a tritium atmosphere (96.9 mol %, 101 kPa, initial fill conditions) for three months. Selected physical and mechanical properties of the five plastics were examined. Mass spectrometric data showed the growth of protium and HT impurity in the tritium gas. DOE

N82-31476# Commissariat a l'Energie Atomique, Cadarache (France). Dept. des Reacteurs a Neutrons Rapides.

GRANULOMETRIC STUDY OF SODIUM AEROSOLS BY LASER SPECTROSCOPY

J. P. Baldassari Dec. 1980 47 p In FRENCH Presented at the CEA-GKAE Seminar: Technol. of Fast Neutron Reactors, Cadarache, France, 12-21 Dec. 1978

(CEA-CONF-5260) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The theoretical background, the experimental procedures, and the results of the in situ method for measuring sodium aerosol granulometry are discussed. This laser spectroscopy technique utilizes the correlation functions of light intensity fluctuations caused by the Brownian motion of sodium aerosols to determine aerosol granulometry and diffusion coefficient. The PAVANA test rig was used to conduct experiments with sodium aerosols at temperatures ranging from 100 C to 300 C and 360 l/hr flowrate, average diameter and dispersion factor found to be 3 microns and 0.37 respectively. DOE

N82-31477# Spectron Development Labs., Inc., Costa Mesa, Calif.

EXPERIMENTAL INVESTIGATION OF SYNFUEL SPRAY CHARACTERISTICS AND COMBUSTION DYNAMICS Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1981

Oct. 1981 37 p refs

(Contract DE-AC22-80PC-30299)

(DE82-010788; SDL-82-2176-24Q) Avail: NTIS HC A03/MF A01

Spray formation with petroleum based fuels was studied. The fuel heating system was modified to provide well controlled temperatures up to 1320 C with No. 6 fuel oil. A simplex and a two fluid atomizing injector with No. 6 fuel oil were tested. Assembly of a traverse system for the Droplet Sizing Interferometer (DSI), installation and alignment of the DSI, and initiation of spray characterization measurements were studied. The monodisperse droplet combustion facility was assembled and operated without a droplet stream. A pulsed droplet ejection (ink jet) device for the generation of a monodisperse droplet stream is developed. A design of a droplet generator is completed and the procurement of parts is initiated. DOE

N82-31478# Pittsburg and Midway Coal Mining Co., Englewood, Colo.

SOLVENT-REFINED-COAL (SRC) PROCESS: MOLECULAR SIEVE DRIER TESTS ON PDU P-99, VOLUME 6, PROCESS DEVELOPMENT UNIT WORK, PART 3, ENGINEERING STUDIES Interim Report, Apr. - Aug. 1981

J. A. Gray, J. G. Iantorno, and W. Gall Feb. 1982 49 p refs

(Contract DE-AC05-76ET-10104)

(DE82-011202; DOE/ET-10104/37; RDR-53; IR-62) Avail: NTIS HC A03/MF A01

A molecular sieve (Type 3A) drier system was installed on PDU P-99 for testing. During 70 h of continuous operation, three drying and two regeneration cycles were completed. The drier processed bleed off gas at unit pressure and ambient temperature in tandem with the butane scrubber. High pressure hydrogen regenerated the molecular sieve adsorbent at 5000 F. The results were in good agreement with the predicted performance, and the apparatus operated with minimum difficulty. DOE

N82-31479# Pittsburg and Midway Coal Mining Co., Englewood, Colo.

SOLVENT-REFINED-COAL (SRC) PROCESS. PREPILOT SRC-2 DEVELOPMENT PROJECT: HYDROGEN MASS-TRANSFER STUDY Interim Report, Feb. - Sep. 1981

N. L. Carr, W. E. King, Jr., and W. G. Moon Feb. 1982 44 p refs

(Contract DE-AC05-76ET-10104)

(DE82-010772; DOE/ET-10104/22; RDR-53; IR-45) Avail: NTIS HC A03/MF A01

The experiments performed on the A-1 Unit to investigate hydrogen mass transfer effects in SRC-II coal liquefaction reactors are summarized. An Ireland coal was investigated for the effects of mixing energy level, method of hydrogen introduction, and hydrogen treat rate. Powhatan No. 6 coal was investigated for the effect of mixing energy level. It is indicated that below a mixing energy level corresponding to 400 rpm a significant cement like solid deposition within the reactor occurs. Below this mixing energy level the C5( ) liquid yield decreases, and the selectivity of the reaction changes, resulting in an increase in the C1-C4 yield. Increasing the preheater hydrogen flow from 4 to 6 q of H2/100 g of slurry prevented the formation of solid deposits at a mechanical mixing energy level as low as that corresponding to 200 rpm. The highest C5( ) yield in the entire data set occurred when the preheater hydrogen flow was at the higher level. DOE

N82-31480# Minnesota Univ., St. Paul.

INTERFACIAL CHEMISTRY IN SOLVENT EXTRACTION SYSTEMS Progress Report, 1 Mar. 1981 - 28 Feb. 1982

Ronald D. Neuman Oct. 1981 20 p ref

(Contract DE-AC04-81ER-10859)

(DE82-007946; DOE/ER-10859/1) Avail: NTIS HC A02/MF A01

Laser light-scattering techniques were further developed and extended to oil/water interfacial systems. A differential technique was developed to suppress laser noise. This noise which is of little concern for measurements at the air/water interface produces interfering signals in the spectra from oil/water interfaces. The laser heterodyne light-scattering apparatus was modified to substantially improve the resolution and accuracy of the measurements so that determination of the interfacial elasticity and interfacial viscosity of monomolecular films at oil/water interfaces is possible. Preliminary desorption studies of several long-chain compounds containing carboxylate or phosphate head groups at the n-decane/water interface were undertaken. Experimental techniques are to improve the reliability of the desorption measurements of spread films are being developed. It was found that provisions for cleaning the interface and compressing the film are essential in order to produce a well defined interfacial film. A new interfacial trough with these capabilities is being constructed to study the structure and dynamics of extractant molecules at n-hexane/aqueous interfaces. DOE

N82-31481# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Physics and Laser Spectroscopy Group.

RECENT PROGRESS IN PHOTOTHERMALLY-BASED SPECTROSCOPIES

Nabil A. Amer Sep. 1981 5 p refs Presented at the Workshop on Advan. Laser Spectry. for Chem. Meas., Ames, Iowa, 6-7 Oct. 1981

(Contract W-7405-eng-48)

(DE82-002555; LBL-13373; CONF-811038-1) Avail: NTIS HC A02/MF A01

The major objective is to exploit novel optical heating schemes for the ultrasensitive, unambiguous, and relatively simple characterization of effluents produced during energy production and utilization. The physical principle underlying these detection schemes is that when a beam of electromagnetic radiation is absorbed by a given medium (gas, liquid, solid, or aerosol), heating will ensue. The heat is what we employ to measure very low optical absorption coefficients. This is accomplished in one of three ways: (1) optical heating will cause a rise in pressure which can be detected with a suitable transducer, e.g., a microphone; (2) optical heating causes a corresponding modulation of the index of refraction of the absorbing material which can be used to deflect a weak laser probe beam propagating through the material; and (3) in the case of solids, heating will cause deformation of the sample which can be detected and related to the optical absorption coefficients. DOE

N82-31482# Los Alamos Scientific Lab., N. Mex. Center for Nonlinear Studies.
POLYACETYLENE AND RELATIVISTIC FIELD-THEORY MODELS
A. R. Bishop, D. K. Campbell, and K. Fesser 1981 13 p refs Presented at the Intern. Conf. on Low-dimensional Conductors, Boulder, Colo., 10 Aug. 1981
(Contract W-7405-eng-36)
(DE82-000589; LA-UR-81-2653; CONF-810864-3) Avail: NTIS HC A02/MF A01

Connections between continuum, mean field, adiabatic Peierls-Froehlich theory in the half filled band limit and known field theory results are discussed. Particular attention is given to the phi4 model and to the solvable N = 2 Gross-Neveu model. The latter is equivalent to the Peierls system at a static, semiclassical level. Based on this equivalence, the prediction of both kink and polaron solitons in models of trans-(CH) sub x are noted. Polarons in cis-(CH) sub x are compared with those in the trans isomer. Optical absorption from polarons is described, and general experimental consequences of polarons in (CH) sub x and other conjugated polymers is discussed. DOE

N82-31483# Los Alamos Scientific Lab., N. Mex.
ISOTOPE-DILUTION MASS SPECTROMETRY IN THE MEASUREMENT OF PLUTONIUM ISOTOPE HALF-LIVES
Robert M. Abernathey and S. Fredric Marsh 1981 7 p refs Presented at the 25th Conf. on Anal. Chem. in Energy Technol., Gatlinburg, Tenn., 6-8 Oct. 1981 Submitted for publication
(Contract W-7405-eng-36)
(DE82-000696; LA-UR-81-2886) Avail: NTIS HC A02/MF A01

Isotope dilution mass spectrometry was used to measure the half-lives of Pu-239, Pu-240, and Pu-241. The latter was determined by measuring the rate of decrease of the Pu-241/Pu-242 ratio in an appropriate isotopic mixture over a period of several years. The half lives of the two lighter isotopes are too long to be determined in this manner. They were determined by measuring the rate of production of the uranium daughter relative to a known added U-233 spike. Experimental procedures were designed to control sources of error and to permit a detailed statistical treatment which included all known sources of error and acounted for all covariances. The uncertainties, at the 95% confidence level, associated with the measured half lives were less than 0.4% Pu-241 and less than 0.2% for Pu-239 and Pu-240. DOE

N82-31484# Brookhaven National Lab., Upton, N. Y.
TRENDS IN NUCLEAR SPECTROSCOPY WITH (MORE OR LESS) DIRECT REACTIONS
Ole Hansen 1981 20 p refs Presented at the 5th European Phys. Soc. Gen. Conf., Istanbul, 7-11 Sep. 1981
(DE81-031970; BNL-30073; CONF-810978-1) Avail: NTIS HC A02/MF A01

Recent experiments on the Gamow-Teller giant resonance are discussed with special regard to the strength sum rules. Some ideas for further investigations of pairing collective modes are presented. The emphasis is on one fermion two boson states and on two boson transfer reactions. Finally some new experimental results from heavy ion inelastic scattering are presented and the role of such processes in the energy ion mechanisms leading to deep inelastic collisions is discussed. DOE

N82-31485# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Lab.
FORMALDEHYDE PHOTODISSOCIATION: MOLECULAR BEAM, PRODUCT APPEARANCE RATE, AND CARBON-14 ISOTOPE-ENRICHMENT STUDIES Ph.D. Thesis
Pauline Ho Dec. 1981 167 p refs
(Contract W-7405-eng-48)
(DE82-010594; LBL-13869) Avail: NTIS HC A08/MF A01

Several aspects of the formaldehyde photopredissociation mechanism were studied. The technique of crossed laser and molecular beams was used to study the system under collisionless conditions. Detection of the molecular product CO after excitation of H2CO near the S1 origin gives strong support to the sequential decay model for fast nonradiative decay of S1 states. For H2CO excitation at 283.9 nm, formation of the radical product HCO dominates dissociation to molecular products by an order of magnitude. CO appearance rates for H2CO excitation at 354.7, 317.0, 298.5 and 283.9 nm were measured by time-resolved absorption of a CO laser, and were the same within approx. 20%. These measurements could be complicated by rotational relaxation; an impulse approximation calculation using the CO translational energy distribution from the molecular beam experiment suggests that CO should be formed in high J states. The evidence for an intermediate in H2CO photodissociation may thus be compromised. Laser enrichment of archaeological samples could greatly improve the range of radiocarbon dating. DOE

N82-31486# California Univ., Berkeley. Lawrence Berkeley Lab.
FUNCTION, J (X,Y), OCCURRING IN PROBLEMS OF SOLUTE TRANSPORT WITH NONEQUILIBRIUM INTERPHASE MASS TRANSFER
C. L. Carnahan Jul. 1981 36 p refs
(Contract W-7405-eng-48)
(DE82-011098; LBL-13116) Avail: NTIS HC A03/MF A01

The function, J(x,y), which has appeared frequently in analytical solutions of a variety of technical problems, is described and its applications briefly reviewed. Two detailed examples of applications are given. Tabulations of functions related to J(x,y) are listed, and relationships of J(x,y) to these functions are stated. Methods of computation of J(x,y), suitable for use with digital computers, are described. DOE

N82-31487# Los Alamos Scientific Lab., N. Mex.
LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS): A NEW SPECTROCHEMICAL TECHNIQUE
Leon J. Radziemski, Thomas R. Loree, and David A. Cremers 1982 7 p refs Presented at the Conf. on Workshop on Optical and Laser Remote Sensing, Monterey, Calif., 9-11 Feb. 1982
(DE82-008175; LA-UR-82-465; CONF-820230-1) Avail: NTIS HC A02/MF A01

The breakdown spark from a focused laser beam was used to generate analytically useful emission spectra of minor constituents in air and other carrier gases. The medium was sampled directly. It was not necessary to reduce the sample to solution nor to introduce electrodes. The apparatus is particularly simple; a pulsed laser, spectrometer, and some method for time resolution. The latter is essential in laser-induced-breakdown spectroscopy (LIBS) because of the strong early continuum. High temperatures in the spark result in vaporization of small particles, dissociation of molecules, and excitation of atomic and ionic spectra, including species which are normally difficult to detect. In one application, beryllium was monitored in air at concentrations below 1 ppB (w/w). In another chlorine and fluorine atoms were monitored in real time. The LIBS system has the potential for real time direct sampling of contaminants in situ. DOE

N82-31488# Sandia Labs., Livermore, Calif.
COMBUSTION APPLICATIONS OF LASER-INDUCED BREAKDOWN SPECTROSCOPY
R. W. Schmieder Mar. 1982 25 p refs Presented at Electro-Optics/Laser Conf., Anaheim, Calif., 17 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-009844; SAND-81-8886; CONF-811164-3) Avail: NTIS HC A02/MF A01

A series of experiments at Sandia Laboratories demonstrated the utility of spectroscopic analysis of the emission from laser produced sparks as a new and potentially powerful diagnostic for combustion. The technique has high space time resolution and generates intense emission easily detectable over background luminescence. The spectra give relative atomic abundances (independent of molecular state) and therefore describe a conserved scalar quantity which is useful for modelling. The process of spectral analysis is simply interpolation between known standards, obviating the need for absolute emission spectroscopic measurement. Experiments on gas mixtures, jets, flames, and fuel vapors explored various aspects and limitations of the technique

for these systems. The Sandia work concentrated on using time integrated emission from sparks produced by a CO2 TEA laser using high spectral resolution for determining abundances of major species (H, C, N, O), but extension of the technique to time resolved spectra and minor species is indicated. DOE

N82-31489# Montana State Univ., Bozeman. Dept. of Chemical Engineering.
CATALYTIC HYDROGENATION OF COAL-DERIVED LIQUIDS Interim Report, Sep. - Nov. 1981
Lloyd Berg and F. P. McCandless Dec. 1981 49 p refs
(Contracts DE-AC22-76ET-10495; EX-76-C-01-2034)
(DE82-007910; DOE/ET-10495/T4; FE-2034-25) Avail: NTIS HC A03/MF A01

An experimental study was completed to determine the optimum relationship between temperature and space velocity for a hydrotreating-hydrocracking catalyst developed for the denitrogenation of solvent refined coal (SRC-II). The temperature range was 350 to 5000 C, liquid hourly space velocity was 0.25 to 2.5 and the throughput was held constant at 4500 ml-60ml of catalyst. The surprising result is that 5000 C and 1.25 LHSV is the best conditions. Conditions were finally found under which a commercially available catalyst will give acceptability denitrogenation of SRC. It is Harshaw's HT400 E 1/32" and the unique factor is to add 1.5 volume percent of water to the SRC feed. When operated in this manner, the catalyst gave < 0.3 wt percent nitrogen in the product for 140 hours, was regenerated and did even better. Without water addition, specification denitrogenation was obtained for only forty hours. The hydrotreating-hydrocracking catalyst that was developed demonstrated hundreds of hours of use and dozens of regenations, both in batch and trickle bed reactors. This appears to be an economically attractive way to convert solvent refined coal into an acceptable feedstock for a conventional petroleum refinery and thus permit coal to reduce somewhat the burden on petroleum for transportation on grade fuels. DOE

N82-31490# Brigham Young Univ., Provo, Utah.
INVESTIGATION OF SULFUR-TOLERANT CATALYSTS FOR SELECTIVE SYNTHESIS OF HYDROCARBON LIQUIDS FROM COAL-DERIVED GASES Annual Technical Progress Report, 19 Sep. 1980 - 18 Sep. 1981
C. H. Bartholomew 31 Oct. 1981 59 p refs
(Contract DE-AC22-79ET-14809)
(DE82-007161; DOE/ET-14809/8) Avail: NTIS HC A04/MF A01

Iron and cobalt catalysts were characterized and activity/selectivity tested. Preparation of boride promoted cobalt and iron catalysts was refined and nearly completed. H2 and CO adsorption and oxygen titration measurements were performed on a number of supported and unsupported catalysts, especially several boride promoted cobalt and iron catalysts. Activity/selectivity tests of 3 and 15% Fe/SiO2 and Co/SiO2 and of 6 boride cobalt and iron catalysts were completed. The product distributions for iron and cobalt boride catalysts are unusual and interesting. Boron promoted iron is more active and stable than iron-silica; cobalt boride has an unusually high selectivity for alcohols. Tests to determine effects of H2S poisoning on activity/selectivity properties of 15% Co/SiO2 indicate that a significant loss of activity occurs over a period of 24 to 28 h in the presence of 10 to 20 ppM H2S. Product selectivity to liquids increased through a maximum during the gradual addition of sulfur. DOE

N82-31491# Massachusetts Inst. of Tech., Cambridge.
FREEBOARD REACTIONS IN FLUIDIZED-COAL COMBUSTION Technical Progress Report, 1 Aug. 1 Oct. 1981
J. M. Beer and P. M. Walsh 30 Nov. 1981 37 p refs
(Contract DE-FG22-80PC-30215)
(DE82-007859; DOE/PC-30215/3) Avail: NTIS HC A03/MF A01

The solid particle concentrations and concentration distribution of stable gaseous species along the height of the freeboard of the fluidized combustor were determined as functions of gas velocity and air/fuel ratio. Freeboard processes which are important determinants of the efficiency and emission of fluidized combustors are emphasized. Conclusions are: (1) temperature measured along the centerline of the combustor were uniform within 50 K from the distributor to the outlet, with and without overfire air; (2) variation of the bed particle size distribution from run to run was negligible despite variation of the primary air/fuel stoichiometric ratio and variation of superficial velocity; (3) a similar complex structure in the axial profiles of O2 was observed in the bed at different primary stoichiometric ratios and superficial velocities; (4) the axial profiles of all C1 to C3 hydrocarbons at a given set of bed conditions were similar, indicating that they may be considered together for modeling purposes; and (5) the axial profile of NO in the bed depended markedly on the primary air/fuel stoichiometric ratio. DOE

N82-31492# Miami Univ., Fla. Div. of Marine and Atmospheric Chemistry.
INTERACTION OF COPPER WITH THE SURFACE OF CALCITE
M. L. Franklin and John W. Morse Berkeley, Calif. California Univ., Berkeley. Lawrence Berkeley Lab. Dec. 1981 42 p refs
(Contract W-7405-eng-48)
(DE82-007923; LBL-13708) Avail: NTIS HC A03/MF A01

The interaction of Cu ions in solution with the surface of calcite was studied in a range of solutions from pure water to seawater. Observations of the uptake of Cu from solution onto calcite indicates that the process is rapid and strong in both distilled water and seawater. In distilled water, Cu uptake is directly proportional to the concentration of Cu in solution; Cu sub s = K sub s Cu1. The average value for K sub s is 3.5 - 1.7. The Cu sub s dependence on Cu1 is linear over the entire Cu concentration range studied (0.1 to 200 SIGMA M). A precipitate of the form Cu sub x Ca sub 1-x CO3 may be deposited onto the calcite surface in distilled water. The value of K sub s in distilled water decreased sharply over the solid to solution ratio range of 0.1 to 2 g CaCO3 1(+1). This was followed by a small change in K sub s for solid to solution ratios in the range of 2 to 10 g CaCO3 1(+1). In seawater, the uptake of Cu is also directly proportional to the concentration of Cu1 up to a limiting value of approximately 13 SIGMA M. DOE

N82-31493# Wisconsin Univ., Madison.
MECHANISTIC STUDIES RELATED TO THE METAL CATALYZED REDUCTION OF CARBON MONOXIDE TO HYDROCARBONS Progress Report, 1 Apr. 1980 - 31 Jan. 1982
Charles P. Casey Jan. 1982 17 p refs
(Contract DE-AC02-77ER-04222)
(DE82-009796; DOE/ER-04222/4) Avail: NTIS HC A02/MF A01

The crystal structures of analogous metal formyl and metal acetyl complexes were determined and the differences analyzed. New heterobimetallic compounds were prepared for study as possible carbon monoxide hydrogenation catalysts. The synthesis of related bridging methyl, methylene, and methylidyne complexes was achieved. Several types of reversible chemical reactions were discovered including eta (5)-C5H5 yields eta (1)-C5H5 rearrangements and addition of C-H bonds to alkenes. DOE

N82-31494# Los Alamos Scientific Lab., N. Mex.
THERMAL ANALYSIS IN SUPPORT OF LASER PYROLYSIS COAL CHARACTERIZATION STUDIES
Gloria Bennett and Martiel Luther Feb. 1982 35 p refs
(Contract W-7405-eng-36)
(DE82-009714; LA-9188-MS) Avail: NTIS HC A03/MF A01

Thermal analyses and particle characterizations are discussed for continuous wave CO2 laser pyrolysis experiments on coal powders. The purpose is to define the sample geometry and determine the thermal environment during an experiment. Particle size distributions are determined from microscopic examination to obtain the average particle diameter and the distribution of diameters. Several thermal analyses, each in increasing detail, are made. Observation of heated samples with pyrolysis cavities suggests a dependence on particle diameter that cannot be predicted with a continuum description of the coal powder. Results from the idealized coal particle models indicate that the particles cannot be treated isothermally. The calculated particle temperature gradients and surface temperatures indicate that pyrolysis and

softening occur during the laser pulse. Examination with the scanning electron microscope confirms the trends predicted by the calculations. DOE

N82-31495# Washington State Univ., Pullman. Dept. of Mechanical Engineering.
ATOMIZATION OF COAL-METHANOL SLURRIES
E. Crow, S. J. Kim, and C. T. Crowe 1982 11 p Presented at the Spring Meeting of the Western States Sect. of the Combustion Inst., Salt Lake City, 12 Apr. 1982
(Contract DE-FG22-80PC-30216)
(DE82-011945; DOE/PC-30216/2; CONF-820403-4) Avail: NTIS HC A02/MF A01

Methanol, 15% coal methanol and 30% coal methanol were atomized at 30 and 60 psi. The droplet size was slightly smaller at the higher pressure. The concentration of coal particles did not have an appreciable effect. DOE

N82-31496# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ETHANOL PRODUCTION VIA FUNGAL DECOMPOSITION AND FERMENTATION OF BIOMASS. PHASE 2 (FY 1981) Annual Progress Report
Antionios A. Antonopoulos and Edward G. Wene Oct. 1981 36 p refs
(Contract W-31-109-eng-38)
(DE82-009492; ANL/EES-TM-162) Avail: NTIS HC A03/MF A01

The isolation and development of Fusarium strains that can efficiently and economically decompose plant polysaccharides to pentoses and hexoses and ferment them to ethanol for fuel purposes are discussed. More than 800 new Fusarium isolates were isolated and screened. All showed cellulolytic activity. The Fusarium mutant ANL 3-72181 (derived after ultraviolet exposure of ANL 22 isolate) produced 2.45 iu cellulase after 14 days. This cellulase activity was achieved in the presence of 0.7 mg-mL extracellular protein. In separate tests, the use of both proteose peptone and yeast extract with 1% cellulose increased the production of extracellular protein three times over that on cellulose alone. Initial fermentation by Fusarium strains on 1% glucose produced up to 4.2 mg-mL ethanol in 48 hours. All Fusarium isolates and mutants found during this period were screened for xylose fermentation. By recycling Fusarium cell mass, fermentations of 1% xylose yielded 4.0 to 4.3 mg-mL ethanol in 48 hours. Consecutive fermentations of 2% xylose produced an average of 8.1 mg-mL ethanol in 48 hours. DOE

N82-31497# California Univ., Berkeley. Lawrence Berkeley Lab.
HYDROGEN OR CARBON MONOXIDE IN THE LIQUEFACTION OF BIOMASS
H. Davis, C. Figueroa, and L. Schaleger Feb. 1982 18 p refs
(Contract W-7405-eng-48)
(DE82-008424; LBL-14018) Avail: NTIS HC A02/MF A01

The bench-scale continuous biomass liquefaction unit, in operation at Lawrence Berkeley Laboratory (LBL), is described. The feedstock is an aqueous slurry of partially hydrolyzed Douglas firewood, but extension to other biomass types and peat is planned. The process has previously used carbon monoxide as reducing gas. Under the conditions employed at LBL, 3300 to 3600 C, 200 to 270 BAR in an atmosphere of steam and reducing gas, no recycle, little or no reducing gas is consumed and it has been shown that hydrogen can be used as the reactant gas. Since large amounts of CO react by the water gas shift reaction, substitution of hydrogen gives a substantial economic advantage. It also opens the possibility of incorporating hydrogenation catalysts and integrating the liquefaction step with separate hydrocracking of crude product. Yields and products are compared with those from the oil-recycle or PERC process. The water slurry process makes less of the desired crude wood-oil product (30 to 40 vs 45 to 55 wt %) and more water soluble organics (about 25 vs about 8 wt %). However, the most operationally successful PERC operations have achieved this product distribution at the expense of extremely high oil and water recycle and large CO consumption. DOE

N82-31498# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PRESENT STATUS ON GASIFICATION/PYROLYSIS PROCESSES IN THE UNITED STATES
Thomas B. Reed Mar. 1982 10 p refs Presented at the Ind. Wood Energy Forum '82, Washington, D.C., 8-10 Mar. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-009543; SERI/TP-234-1560) Avail: NTIS HC A02/MF A01

An eight term matrix of options is presented leading to over 20,000 types of gasifiers, depending on choice of fuel, end product, and other factors discussed in depth. A number of tests are suggested that would help producers and customers evaluate specific gasifiers. DOE

N82-31499# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Elektrotechnik und Elektronik.
SPECTROSCOPIC INVESTIGATIONS OF A FIELD EMISSION GENERATED RADIATIVE ZONE: MASS SPECTROSCOPIC MEASUREMENTS Final Report
J. Mitterauer Oct. 1981 106 p refs
(Contract ESTEC-2734/76/NL-AK(SC))
(ESA-CR(P)-1589) Avail: NTIS HC A06/MF A01

In view of the application of liquid metal field ion sources as electric thrustors for space propulsion, the basic physical features of the field ionization mechanism were analyzed experimentally. An ultrahigh vacuum test chamber and a liquid metal ion source were built. Diagnostic methods, e.g., basic measurements of the emission characteristics, probe measurements of the ion current distribution, mass spectroscopic measurements of the particles emitted from the ion source, and spectroscopic measurements of the visible radiation accompanying field ionization, were developed. Experimental data which can be transferred to prototype field ion thrusters are presented, but experimental facilities limit conclusions regarding theoretical aspects of field ionization. Author (ESA)

N82-31500# Thoratec Labs. Corp., Berkeley, Calif.
PROCUREMENT OF PRIMARY REFERENCE MATERIALS Annual and Quarterly Progress Report, 1 Apr. 1980 - 31 Mar. 1981
Robert S. Ward, Jr., Barbara Tsuchiyama, Kathleen O'Connor, Can Hu, and Vraj Lathiya Jun. 1981 154 p refs
(Contract N01-HV-2933)
(PB82-164708; NIH-N01-HV-9-2933-1; ARP-2; QPR-7) Avail: NTIS HC A08/MF A01 CSCL 07D

Progress in the production of silica free polydimethyl siloxane (PSX) sheet and tubing is described. A serious adhesion problem in Lot 01 was traced to excessive 2,4-dichlorobenzoic acid catalyst residue in purchased substrate PSX. Improved solvent extraction and postcuring eliminated the problem in subsequent lots. Thorough characterization was performed on starting materials, PSX substrates silica free coating fluids and nonsterile and sterile primary reference materials (PRM). Characterization and production procedures were written for the complete PRM manufacturing process. A method for internal and external tubing coating was successfully applied in PRM production. The continuous reactor was modified to eliminate clogging at high molecular weights. DOE

N82-31501# National Inst. for Metallurgy, Randburg (South Africa). Analytical Chemistry Div.
THE ASSESSMENT OF PELLICULAR ANION-EXCHANGE RESINS FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY
C. Pohlandt 30 Oct. 1981 21 p refs
(PB82-166091; NIM-2132; ISBN-0-86999-557-X; PR-3) Avail: NTIS HC A02/MF A01 CSCL 07D

Because pellicular anion-exchange resins suitable for the determination, by ion chromatography, of anions with alkaline fluents were unavailable in South Africa at the inception of this work, an attempt was made to prepare such resins. It is shown that the pellicular resins produced are more efficient than the surface-aminated resins used previously. The simultaneous separation and determination of five common anions is demon-

strated. The method was applied to the analysis of uranium leach liquors, effluent samples, and a solid sample of ferric oxide (goethite). DOE

N82-31502# Man-Made Fiber Producers Association, Inc., Washington, D.C.
AIRFLOW EXTINGUISHMENT OF BURNING APPAREL FABRICS Final Report
B. B. Hibbard, J. F. Krasny, E. Braun, and R. D. Peacock Dec. 1981 41 p refs
(PB82-165267; NBSIR-81-2386) Avail: NTIS HC A03/MF A01 CSCL 21B

The heat output of a burning fabric, subjected to a frontal airflow at various velocities, was measured behind the burning face of the fabric. Twelve different commercial fabrics were evaluated in this manner on a apparel fire modeling apparatus (AFMA). When the fabric burned to a given heat output, the elected level of airflow was applied to the face of the burning fabric in an attempt to extinguish the flame. Burn injury area, maximum total heat, and time to extinguishment were determined from AFMA data. The burning fabrics quickly extinguished with an airflow of 213 meters per minute (8 mph) or less in all but one of the fabrics studied. The one exception was an 85-15 cotton and polyester double faced, terry cloth fabric where this and higher airflows only increased the rate of burning. Author (GRA)

N82-31503# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
AN INVESTIGATION OF FIRE IMPINGEMENT ON A HORIZONTAL CEILING
H. Z. You and G. M. Faeth Dec. 1981 84 p refs
(Grant NBS-7-9020)
(PB82-165838; NBS/GCR-81/304) Avail: NTIS HC A05/MF A01 CSCL 13M

The structure and heat transfer properties of fires and fire plumes impinging on a horizontal ceiling were investigated. Profiles of mean velocity, temperature, composition and mixture fraction were measured. Turbulence quantities were also measured in the plume, including longitudinal fluctuations and Reynolds stress. The measurements were compared with predictions of both differential and integral models. Integral models were developed for both the plume and ceiling jet portions of the flow. Computational convenience was emphasized during the construction of these models; therefore, top-hat profiles a flow entrainment expression, and a mixing-controlled combustion model are assumed. Author (GRA)

N82-31504# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
AN INVESTIGATION OF AXISYMMETRIC BUOYANT TURBULENT DIFFUSION FLAMES
S. M. Jeng, L.-D. Chen, and G. M. Faeth Jan. 1982 91 p refs
(Grant NBS-7-9020)
(PB82-165176; NBS/GCR-82/367) Avail: NTIS HC A05/MF A01 CSCL 13L

The structure of axisymmetric, buoyant, turbulent diffusion flames in still air were measured. Profiles of mean temperature, mean velocity, velocity fluctuations and total radiant heat flux were completed for methane flames, including careful characterization of burner exit conditions, in order to provide data for the evaluation of models of the process. Preliminary tests also provided mean temperature profiles for propane flames. Test conditions were chosen so that the flow was turbulent near the burner exit while effects of buoyancy were significant over most of the luminous portion of the flames. Measurements were compared with predictions of a k epsilon g differential model, which included effects of buoyancy in the transport equations for turbulence quantities.GRA

N82-31957# Heidelberg Univ. (West Germany). Abt. Numerische Mathematik.
NUMERICAL SIMULATION OF VERY LARGE CHEMICAL REACTION SYSTEMS [NUMERISCHE SIMULATION SEHR GROSSER CHEMISCHER REAKTIONSSYSTEME]
Peter Deuflhard *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 71-75 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

N82-32065*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry.
FORMATION OF METALLIC AND METAL HYDROUS OXIDE DISPERSIONS
Egon Matijevic and R. S. Sapieszko *In* Alabama Univ. UAH/NASA Workshop of Fluids Expt. System 1979 p 59-94 refs (For primary document see N82-32058 22-70)
(Grants NSF CHE-77-02185; NSF ENG-75-08403; EPRI Proj. RP-966-1)
Avail: NTIS HC A12/MF A01 CSCL 07D

N82-32071*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLOW AND THERMAL EFFECTS IN CONTINUOUS FLOW ELECTROPHORESIS
D. A. Saville (Princeton Univ., N.J.), P. H. Rhodes, and R. S. Snyder *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 136-145 ref (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 07D

N82-32265# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
BASE AND EXTERNAL BURNING FOR PROPULSION
Warren C. Strahle and James E. Hubbartt *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 9 p refs (For primary document see N82-32256 22-99)
(Contract FA9620-78-C-0003)
Avail: NTIS HC A12/MF A01

N82-32268# Naval Weapons Center, China Lake, Calif.
BORON COMBUSTION IN DUCTED ROCKETS
Klaus C. Schadow *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1902 12 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32271# University of Southern California, Los Angeles. Dept. of Mechanical Engineering.
THE ROLE OF LIQUID PHASE DROPLET DECOMPOSITION IN AN ADVANCED AIRBREATHING PROPULSION SYSTEM
Melvin Gerstein and P. Roy Choudhury *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 8 p refs (For primary document see N82-32256 22-99)
(Grant AF-AFOSR-3354-77)
Avail: NTIS HC A12/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-31505* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NICRAL TERNARY ALLOY HAVING IMPROVED CYCLIC OXIDATION RESISTANCE Patent
Charles A. Barrett (NAS-NRC, Washington, D.C.), Carl E. Lowell (NAS-NRC, Washington, D.C.), and Abdus S. Khan (NAS-NRC, Washington, D.C.) Issued 20 Jul. 1982 3 p Filed 23 Oct. 1980 Supersedes N81-12211 (19 - 03, p 0322) Sponsored by NASA
(NASA-Case-LEW-13339-1; US-Patent-4,340,425;
US-Patent-Appl-SN-199769; US-Patent-Class-148-428;
US-Patent-Class-420-445; US-Patent-Class-420-551;
US-Patent-Class-420-588) Avail: US Patent and Trademark Office CSCL 11F

NiCrAl alloys are improved by the addition of zirconium. These alloys are in the Beta or gamma/gamma' + Beta region of the ternary system. Zirconium is added in a very low amount between

0.06 and 0.20 weight percent. There is a narrow optimum zirconium level at the low value of 0.13 weight percent. Maximum resistance to cyclic oxidation is achieved when the zirconium addition is at the optimum value.

Official Gazette of the U.S. Patent and Trademark Office

N82-31506 Defence Research Information Centre, Orpington (England).

THE EFFECT OF DIFFUSION PHENOMENA ON THE OXIDATION MECHANISM OF Ni-Cr ALLOYS

P. Moulin, A. M. Huntz, and P. Lacombe May 1982 38 p refs Transl. into ENGLISH from Acta Metal. (France), v. 28, no. 6, 1980 p 745-756

(DRIC-T-6609; BR83495) Copyright. Avail: Issuing Activity

The oxidation behavior of austenitic Ni-Cr alloys was studied in pure oxygen for temperatures between 900 and 1300 C, in order to determine the influence of diffusion phenomena on selective oxidation. The development and the growth kinetics of a continuous and protective Cr203 layer depend on volume and intergranular diffusion of alloy elements in the metallic matrix and on the chromium content of the alloy. For chromium contents < 30% the oxidation kinetics are controlled by the diffusion of alloy elements in the metallic matrix. Above 30% they are controlled by cationic diffusion in the oxide scale. Author (ESA)

N82-31507# Aerospace Corp., El Segundo, Calif.

CLOCK ERROR MODELS FOR SIMULATION AND ESTIMATION

J. S. Meditch 5 Oct. 1981 64 p refs

(Contract F04701-75-C-0076)

(Aerospace-TOR-0076(6474-01)-2) Avail: NTIS HC A04/MF A01

Mathematical models for the simulation and estimation of errors in precision oscillators used as time references in satellite navigation systems are developed. The results, based on all currently known oscillator error sources, are directly implementable on a digital computer. The simulation formulation is sufficiently flexible to allow for the inclusion or exclusion of individual error sources as desired. The estimation algorithms, following from Kalman filter theory, provide directly for the error analysis of clock errors in both filtering and prediction. Author

N82-31508*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

VARIABLE ANODIC THERMAL CONTROL COATING Patent Application

Charles S. Gilliland and Roy J. Duckett, inventors (to NASA) Filed 9 Apr. 1982 13 p

(NASA-Case-LAR-12719-1; US-Patent-Appl-SN-367134) Avail: NTIS HC A02/MF A01 CSCL 11F

This invention relates to a process for providing a variable anodic thermal control coating to aluminum surfaces for use as the external surface area of space vehicles to passively control the temperature of the vehicle when exposed to a spatial environment. In a specific embodiment, a 0.001 inch thick aluminum surface is cleaned by immersion in a metal cleaning bath (160 F to 200 F for ten minutes); rinsed in room temperature water; deoxidized in a chromic acid and sulfric acid mixture; rinsed again with water and dried under forced, filtered air. After the chromic acid coating is applied, the surface is removed from the chromic acid, rinsed in a sealing bath of clear water at 170 F to 200 F for ten minutes, and dried with forced, filtered air at ambient temperature. The novelty of the invention appears to reside in a process for providing a thermal control solar stable surface coating for aluminum surfaces adapted to be exposed to solar radiation wherein selected values within the range of 0.10 to 0.72 thermal emittance and 0.2 to 0.4 solar absorptance are reproducibly obtained by anodizing the aluminum surface area in a chromic acid solution for a selected period of time. NASA

N82-31509*# Colorado State Univ., Fort Collins. Dept. of Physics.

ION BEAM MICROTEXTURING AND ENHANCED SURFACE DIFFUSION Final Report

Raymond S. Robinson Feb. 1982 54 p refs

(Grant NAG3-43)

(NASA-CR-167948; NAS 1.26:167948) Avail: NTIS HC A04/MF A01 CSCL 11F

Ion beam interactions with solid surfaces are discussed with particular emphasis on microtexturing induced by the deliberate deposition of controllable amounts of an impurity material onto a solid surface while simultaneously sputtering the surface with an ion beam. Experimental study of the optical properties of microtextured surfaces is described. Measurements of both absorptance as a function of wavelength and emissivity are presented. A computer code is described that models the sputtering and ion reflection processes involved in microtexture formation. B.W.

N82-31510# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Research Div.

DYNAMIC CHARACTERIZATION OF INTERCRITICALLY ROLLED HIGH-HARDNESS STEEL

Morris Azrin, Albert A. Anctil, and Eric B. Kula Jun. 1982 19 p refs

(DA Proj. 1L1-61102-AH-42)

(AD-A116661; AMMRC-TR-82-38) Avail: NTIS HC A02/MF A01 CSCL 11/6

Two compositions of intercritically rolled homogeneous steel armor were evaluated by quasi-static and dynamic tests. Cross-rolling just below the intercritical temperature resulted in improved fracture toughness at the high-hardness levels (55 and 58 HRC). Taylor cylinder ballistic impact tests indicated a dynamic stress more than double the quasi-static yield stress. The use of this test for evaluating potential high-hardness armor material is discussed. Author (GRA)

N82-31511# Naval Surface Weapons Center, White Oak, Md. Research and Technology Department.

THE MELTING OF SOLID AND POROUS ALUMINUM UNDER SHOCK COMPRESSION Technical Progress Report, Feb. 1980 - Feb. 1981

Clinton T. Richmond 22 Mar. 1982 48 p refs

(ZR01305)

(AD-A116195; AD-F500035; NSCW/R-79-279) Avail: NTIS HC A03/MF A01 CSCL 11/6

The melting point of shock compressed aluminum is calculated according to the prediction of the Lindemann law and the Gruneisen equation of state. The position of this point on the Lindemann melting curve varies with two parameters: the initial state and the porosity of aluminum. Because the Hugoniot of aluminum depends upon these parameters, variation in either the initial state or the porosity implies a family of Hugoniots. Normally, a characteristic (complete) equation of state is needed to determine these Hugoniots. But, in this work a family of Hugoniots is derived for each parameter by using the Gruneisen equation of state and a single experimental Hugoniot. Several melting points are calculated corresponding to various values of the parameter of a Hugoniot. These melting points, Hugoniots, and other thermal properties calculated from the theory are in excellent agreement with the data cited. GRA

N82-31512# California Univ., Santa Barbara.

ALUMINUM CORROSION: CORRELATIONS OF CORROSION RATE WITH SURFACE COVERAGE AND TUNNELING SPECTRA OF ORGANIC INHIBITORS

Q. Q. Shu, P. J. Love, A. Bayman, and P. K. Hansma Jun. 1982 35 p refs Submitted for publication

(Contract N00014-78-C-0011; Grants NSF DMR-79-25340; NSF DMR-79-10030; NR Proj. 065-673)

(AD-A116750; TR-10) Avail: NTIS HC A03/MF A01 CSCL 11/6

Thin films of evaporated aluminum form a convenient model system for studying corrosion and corrosion inhibition on aluminum because 1) corrosion can be conveniently and continuously monitored by both electrical resistance measurements and optical transmission, 2) surface coverage of inhibitor species can be

measured by either radiotracer techniques or tunneling spectroscopy and 3) the nature of surface adsorbed species can be determined with tunneling spectroscopy. The corrosion rate for these films is of order 20 micrometer/yr in pure water at flow rates of order 20 cm/sec. The corrosion is inhibited by roughly one order of magnitude by monolayer surface coverages of the surface species that result when acetic acid, benzoic acid, cupferron or ethylene glycol are added to the water. At surface coverages of order 1/100 of a monolayer, the corrosion rate is increased by roughly an order of magnitude for the first three additives but not for ethylene glycol. From the previous studies of tunneling spectra, it is clear that the acetic and benzoic acids lose a proton to become benzoate and acetate ions of the surface. The ethylene glycol loses the protons from both of its OH groups during bonding. The spectrum of the adsorbed cupferron species is presented but not analyzed. Author (GRA)

N82-31513# Case Western Reserve Univ., Cleveland, Ohio. Center for Electrochemical Sciences.

CORROSION AND PASSIVATION STUDIES OF IRON AND FERROUS ALLOYS Ph.D. Thesis

Gholamabbas Nazri, Ernest Yeager, and B. D. Cahan 15 Dec. 1981 145 p refs

(Contract N00014-79-C-0795)

(AD-A116422; TR-1) Avail: NTIS HC A07/MF A01 CSCL 07/2

Corrosion and passivation of iron and ferrous alloys is an important subject in many disciplines from both theoretical and practical points of view. Corrosion, and particularly passivation, however, is poorly understood despite extreme efforts. The purpose of this work is to understand the mechanism of passivation film formation and reduction, also the structure of passive film. The in-situ electrochemical techniques such as combined cyclic voltammetry and rotating ring disk electrode have been used in different pH of borate buffer solution. Both cyclic voltammetry and potential pulse techniques showed that during passive film formation, the ferrous ions enter into the metal solution interface, which causes a formation of a deposited over-layer on surface of the passive film. In-situ Raman spectroscopy has been used to elucidate the structure of the passive film on iron. The Raman spectra of this film showed several peaks at low frequency (200-800 per cm) which is not the same as any known stoichiometric iron oxides or oxy-hydroxides. In addition, Raman spectroscopy for air oxidized iron-chromium alloys also has been used. The result showed that this technique can be used to study the dry corrosion as well as wet corrosion. Transmission electron microscopy of the passive film on iron showed that the passive film on iron has crystalline structure and also there are some epitaxial relationships between oxide and iron substrate. GRA

N82-31514# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

AS-QUENCHED MICROSTRUCTURES OF RAPIDLY SOLIDIFIED Fe-25 wt % Ni

J. J. Rayment, O. Ashiru (Birmingham Univ., England), and B. Cantor (Oxford Univ., England) Sep. 1981 12 p refs Presented at the ASM Intern. Conf. on Solid-Solid Phase Transformations, Pittsburgh, 10-14 Aug. 1981

(Contract W-7405-eng-48; N00014-78-C-0048)

(DE82-002588; LBL-13272; CONF-810860-7) Avail: NTIS HC A02/MF A01

Specimens of rapidly solidified Fe-25 wt% Ni were obtained by two piston splat quenching. The as quenched microstructures varies from fully austenitic to almost completely martensitic. The microstructures were studied by X-ray diffraction, scanning and transmission electron microscopy and X-ray microanalysis. The fully austenitic specimens reveal a fine grain size (1 to 5 microns) with a high dislocation density. There is evidence for the existence of subgrain boundaries in some of the grains. In addition, two different martensitic microstructures were observed. In the specimens which partially transformed to martensite during quenching, the structure is lath martensite with fine internal twins present in some laths. However, in austenitic specimens which were transformed by cooling in liquid nitrogen, the microstructure is lenticular plate martensite with the characteristic mid-rib. The different structures found in rapidly solidified Fe-25 wt% Ni are discussed. DOE

N82-31515# Mississippi Univ., University. Dept. of Mechanical Engineering.

EFFECT OF PARTIAL PRESSURE AND TEMPERATURE ON PROPERTIES OF VACUUM DEPOSITED CHROMIUM GOLD THIN FILMS

James G. Vaughan, Larry R. Zawicki, and Neal C. Thomas Sep. 1981 16 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3-6 Nov. 1981 Prepared in cooperation with Bendix Corp., Kansas City, Mo.

(Contract DE-AC04-76DP-00613)

(DE82-000891; BDX-613-2687; CONF-811113-22) Avail: NTIS HC A02/MF A01

Chromium gold thin films were deposited on alumina substrates over a pressure range of 0.0267 to 13.3 mPa, with substrate temperatures ranging from 313 to 523 K. A quadrapole residual gas analyzer was used to record the bell jar gas spectrum before and during each run. Correlation of properties with oxygen and hydrogen partial pressure was observed. Adhesion of the chromium gold films as determined by a 90 degree pull test of thermocompression bonded lead frames are bimodal distribution of very low or high strength dependent on oxygen partial pressure and substrate temperature. A system pressure of 6.67 mPa with a substrate temperature of 473 K resulted in the highest pull strengths and acceptable failure modes. DOE

N82-31516# Sandia Labs., Albuquerque, N. Mex.

PRESSURE AND THE STUDY OF QUANTUM EFFECTS AT STRUCTURAL PHASE TRANSITIONS

G. A. Samara 1981 7 p refs Presented at the 8th AIRAPT Conf. and 19th EHPRG Conf., Uppsala, Sweden, 17 Aug. 1981

(Contract DE-AC04-76DP-00789)

(DE81-030207; SAND-81-1306C; CONF-810827-11) Avail: NTIS HC A02/MF A01

The use of hydrostatic pressure to investigate quantum mechanical effects associated with displacive structural phase transitions is discussed. Whereas in almost all materials studied the transition temperatures (T sub c) are sufficiently high at atmospheric pressure that there are no experimentally discernible quantum effects, the application of pressure can reduce T sub c for a variety of materials to T sub c = 0 K, the so-called quantum displacive limit. Quantum effects become experimentally very evident on approaching this limit. Pressure results are presented for K2SeO4 and K72Na28TaO3 and analyzed in terms of recent theoretical models. These results demonstrate that pressure is an excellent parameter for studying the onset of quantum effects and the behavior at the displacive limit. DOE

N82-31517# Hanford Engineering Development Lab., Richland, Wash.

TITANIUM ALLOY TENSILE PROPERTIES AFTER NEUTRON IRRADIATION

D. R. Duncan, R. J. Puigh, and E. K. Opperman 30 Sep. 1981 6 p refs Presented at the 2nd Topical Meeting on Fusion Reactor Mater., Seattle, Aug. 1981 Submitted for publication

(Contract DE-AC14-76FF-02170)

(DE82-000980; HEDL-SA-2440-FP; CONF-810831-62) Avail: NTIS HC A02/MF A01

Irradiated specimens from three duplex annealed titanium alloys were tested in uniaxial tension in air from room temperature to 550 C. The EBR-2 irradiation temperature was 550 C; the maximum fluence was 37 dpa, the highest neutron exposure received by any titanium alloy. Alloy 6242S increased in strength due to reactor exposure by approximately 20% at test temperatures from room to 400 C. The strength of alloy 5621S was unaffected by reactor exposure, while Ti-6Al-4V displayed strength reductions at 550 C. Large ductility losses of 75 to 80% of unirradiated material total elongation were noted after reactor exposure in all three alloys; however, reasonable postirradiation ductility of 0.9 to 8.8% remained in all alloys. DOE

N82-31518# Sandia Labs., Livermore, Calif.
EVALUATION OF THE CURRENT STATUS OF HYDROGEN EMBRITTLEMENT AND STRESS-CORROSION CRACKING IN STEELS
N. R. Moody Dec. 1981 42 p refs
(Contract DE-AC04-76DP-00789)
(DE82-011183; SAND-81-8259) Avail: NTIS HC A03/MF A01

Hydrogen embrittlement and stress corrosion cracking in steels was studied. It is shown that there are several critical areas where data are either ambiguous, contradictory, or nonexistent. A relationship exists between impurity segregation and hydrogen embrittlement effects but it is not known if the impurities sensitize a preferred crack path for hydrogen induced failure or if impurity and hydrogen effects are additive. It is suggested that grain boundary impurities may enhance susceptibility through interactions with some environments. It is shown that fracture initiates at different locations for external and internal hydrogen environments. DOE

N82-31519# Oak Ridge National Lab., Tenn.
FABRICATION, EVALUATION, AND INSPECTION OF COLD-REDUCED AND COLD-DRAWN TUBES OF MODIFIED 9 Cr-1 Mo STEEL
V. K. Sikka, R. E. McDonald, J. H. Smith, and Sigfred Peterson, ed. Feb. 1982 45 p ref
(Contract W-7405-eng-26)
(DE82-007730; ORNL/TM-8009) Avail: NTIS HC A03/MF A01

Modified 9 Cr-1 Mo steel is being developed and commercialized as an alternate steam generator material for breeder reactors. The alloy was commercially melted by the argon-oxygen decarburization process and refined by electroslag remelting. It was commercially fabricated into plate, bar, tube hollows, and entrifugally cast and cold-pilgered tubes. The purpose of this study was to develop procedures for fabricating tubes of various sizes by cold-reducing and drawing processes. Fabricated tubes were subjected to microstructural analysis, hardness measurements, and ultrasonic inspection. DOE

N82-31520# Sandia Labs., Livermore, Calif. Materials Development Div.
EFFECT OF QUENCH RATE AND REFRIGERATION ON THE MECHANICAL PROPERTIES OF HP9-4-20 STEEL
T. F. Klimowicz and J. C. Lippold Feb. 1982 22 p refs
(Contract DE-AC04-76DP-00789)
(DE82-011182; SAND-82-8204) Avail: NTIS HC A02/MF A01

Difficulties in obtaining adequate mechanical properties in the HP9-4-20 portion of the B83 structural midcase raised questions concerning the effect of quench rate and post-quench refrigeration on the strength and toughness of the material. The contribution of these parameters to the observed degradation in properties was investigated. The nominal cooling rate of a full size midcase was calculated numerically using a finite difference thermal conduction code. A series of HP9-4-20 steel samples was then processed with quench rates which bracketed this calculated cooling rate. It was found that neither quench rate nor refrigeration had a significant effect on the mechanical properties at cooling rates that might reasonably be encountered in production hardware. It was concluded that the inadequate mechanical properties exhibited by early B83 midcase components were related to an improper tempering heat treatment, and not an inadequate quench. DOE

N82-31521# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF GLASS-CERAMIC-PROCESSING CYCLE ON THE METALLURGICAL PROPERTIES OF CANDIDATE ALLOYS FOR ACTUATOR HOUSINGS
L. J. Weirick Jan. 1982 41 p refs
(Contract DE-AC04-76DP-00789)
(DE82-011680; SAND-81-0708) Avail: NTIS HC A03/MF A01

The results from an investigation on the effect of a glass ceramic processing cycle on the metallurgical properties of metal candidates for actuator housings are discussed. The cycle consists of a 9800 C sealing step, a 6500 C crystallization step, and a 4750 C annealing step. These temperature excursions are within the same temperature regime as annealing and heat treating processes normally employed for metals. Therefore, the effect of the processing cycle on metallurgical properties of microstructure, strength, hardness and ductility were examined. It was found that metal candidates which are single phase or solid solution alloys (such as 21-6-9, Hastelloy C-276 and Inconel 625) were not affected whereas multiphase or precipitation hardened alloys (such as Inconel 718 and Titanium (ALPHA)-C) were changed by the processing cycle for the glass ceramic. DOE

N82-31522# Oak Ridge National Lab., Tenn.
TENSILE PROPERTIES OF MODIFIED 9 Cr-1 Mo STEEL
V. K. Sikka, R. E. McDonald, M. K. Booke, G. C. Bodine, and Sigfred Peterson, ed. Feb. 1982 71 p refs
(Contract W-7405-eng-26)
(DE82-007726; ORNL/TM-8012) Avail: NTIS HC A04/MF A01

Tensile properties of commercial heats of modified 9 Cr-1Mo alloy are presented for test temperatures in the range from room temperature to 7600 C. Data included the effects of melting practice, compositional differences, strain rate (8.0 to 0.00008 min), postweld heat treatment (1 through 112 hours at 7320 C), tempering temperature (732 and 7460 C versus 7600 C), isothermal annealing (10380 C for 1 hour and 7040 C for 24 hours followed by AC), and thermal aging (5000 and 11,600 hours at 538, 593, and 6490 C). The average-to-minimum property range for the yield and ultimate tensile strengths was compared with the similar data range for standard 9 Cr-1 Mo alloy. Tensile data on commercial heats were used to set the room-temperature specified minimum values for the alloy. The conservativeness of the specified minimum values was checked against the data at several strain rates, data after postweld heat treatment at 7320 C up to 112 hours and data on thermally aged material. DOE

N82-31523# United Kingdom Atomic Energy Authority, Springfields (England). Nuclear Power Development Lab.
THERMAL-SHOCK-FATIGUE STUDY OF TYPE 304 AND 316 STAINLESS STEELS
D. J. Marsh Warrington, Engl. Risley Nuclear Power Development Establishment. Jan. 1982 26 p refs
(DE82-902364; ND-R-606(S)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Thermal fatigue crack initiation and propagation promoted by thermal quenches was studied in type 316 and 304 stainless steels and correlated with isothermal strain-cycling fatigue. Axially unconstrained specimens of rectangular section were held at bulk temperatures of 250 to 5000 C and symmetrically water quenched on the narrow faces to give equivalent surface strain ranges from 2.8 x 10(+3) to 5.4 x 10(+3). Crack initiation in smooth samples showed an apparent theshold at a surface strain range of 2.8 x 10(+3), equivalent to a thermal amplitude of 1500 C, with no cracking being produced in 500,000 cycles. The crack growth in pre-notched samples was evaluated by direct observation and by subsequent fractography and showed two modes of growth. The crack growth was strain controlled during the early stages of propagation where the crack tip was within the surface zone under conditions fully plastic cyclic yield. DOE

N82-31524# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MORPHOLOGY OF ELECTRODEPOSITED COPPER Ph.D. Thesis
A. Kindler Nov. 1981 260 p refs
(Contract W-7405-eng-48)
(DE82-010295; LBL-12838) Avail: NTIS HC A12/MF A01

Copper morphology was investigated after electrodeposition from an aqueous CuSO4-H2SO4 solution in a flow cell with plane parallel electrode. Uniform current distribution and well defined mass transfer conditions present during turbulent forced convection made meaningful investigation of three regimes possible. Direct current deposition at the limiting current, direct current deposition below the limiting current, and pulsed current deposition below the limiting current were studied. DOE

N82-31525# Sandia Labs., Albuquerque, N. Mex.
DEUTERIUM TRAPPING BY IMPURITIES IN COPPER
D. J. Mitchell 1981 17 p refs Presented at Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE81-030120; SAND-81-1888C; CONF-811113-5) Avail: NTIS HC A02/MF A01

The addition of Er, Zr, or Ti to copper provides trapping sites for hydrogen isotopes, which causes the apparent diffusivity of hydrogen to take on values that are smaller than its normal diffusivity in pure copper. This apparent diffusivity can be described in terms of the dopant concentration and the binding energy of the hydrogen isotope to the traps. Criteria are met that enable the results of permeation breakthrough measurements, which were made between 300 and 700 C, to be extrapolated to room temperature. The resultant lag time for deuterium breakthrough for a 0.25 mm thick membrane of Cu containing 0.88 atomic percent Er, for example, exceeds 1000 years at 25 C. Therefore, this alloy is suitable for use in vacuum enclosures where it is necessary to restrict hydrogen permeation for long periods of time. Thermodesorption measurements for samples that were exposed to deuterium reveal that there are two types of traps in these alloys. DOE

N82-31526# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
EROSION BEHAVIOR OF HARD SURFACE COATINGS/ INSERTS
Alan V. Levy and Thomas W. Bakker Dec. 1981 28 p refs Presented at the Intern. Conf. on the Sci. of Hard Mater., Moran, Wyo., 25-28 Aug. 1980
(Contract W-7405-eng-48)
(DE82-010598; LBL-13801; CONF-810856-2) Avail: NTIS HC A03/MF A01

The basic erosion behavior of several of the most promising refractory hard metal coatings and bodies that are currently either in development or commercial use were studied. A representative group of materials was obtained from a few of the suppliers of hard surface materials and tested at room temperature in an air blast tester. The materials selected were meant to be a sample and not a definitive representation of all of this type of material availale. The tests were done at room temperature only to establish an initial basis for understanding the nature of the erosion process and not to attempt to simulate any regime of service conditions. DOE

N82-31527# Hanford Engineering Development Lab., Richland, Wash.
MICROSTRUCTURAL EXAMINATION OF NEUTRON IRRADIATED SIMPLE FERRITIC ALLOYS
D. S. Gelles Sep. 1981 20 p refs Presented at the Intern. Conf. on Neutron Irradiation Effects, Argonne, Ill., 9-12 Nov. 1981
(Contract DE-AC06-76FF-02170)
(DE82-006802; HEDL-SA-2523; CONF-811145-7) Avail: NTIS HC A02/MF A01

Thirteen simple ferritic alloys based on the martensitic stainless steel base composition (wt. %) of Fe-12CR-1Mo-9.1C were prepared. The series included Fe-Cr binary alloys covering the range 3 to 18 Cr at intervals of 3Cr, Fe-Cr-C alloys based on Fe-12Cr with three levels of carbon from 0.002 to 0.2 C and Fe-Cr-C-Mo alloys with variations in molybdenum content up to 3Mo. A heat treatment produced a tempered martensite structure for each alloy condition to emphasize behavior anticipated in martensitic stainless steels. The effects of fast neutron irradiation on the martensitic stainless alloy class are investigated. DOE

N82-31528# Iowa State Univ. of Science and Technology, Ames.
MOESSBAUER EFFECT STUDY OF CORROSION PROCESSES AT IRON SURFACES
M. C. Lin 1981 7 p refs Presented at Conf. on the Appl. of Phys. in the Steel Industry, Bethlehem, Pa., 5 Oct. 1981
(DE82-006257; IS-M-346; CONF-8110133-1) Avail: NTIS HC A02/MF A01

Moessbauer spectroscopy coupled with electrochemical measurements was used to study, in situ, the effects of chloride ions on a passivated iron surface in boric acid-sodium borate buffer solution at a pH of 8.4. The Moessbauer spectrum of the oxide film formed after breakdown of the passive film by aggressive chloride ions consists of a doublet with line-width of 0.51 plus or minus 0.03 mm/sec, isomer shift of 0.35 plus or minus 0.02 mm/sec relative to the metallic iron, and quadrupole splitting of 0.79 plus or minus 0.01 mm/sec. The quadrupole splitting differs from that of the passive film in which it is 0.94 plus or minus 0.06 mm/sec with line-widths of 0.55 plus or minus 0.08 mm/sec, and an isomer shift of 0.36 plus or minus 0.01 mm/sec. However, these parameters are essentially the same as those of the dried passive film and correlate well with those of superparamagnetic (BETA)-Fe2O3. The Moessbauer spectra of oxide films grown in chloride-containing solution and of films exposed to the air for several days are similar to those of films after chemical breakdown. DOE

N82-31529# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
RESEARCH TOWARD NEW ALLOYS FOR GENERATOR RETAINING RINGS
J. W. Morris, Jr. and K. M. Chang (General Electric Co., Schenectady, N.Y.) Nov. 1981 45 p Presented at the MiCon Symp., Houston, Tex., 18 Jan. 1982 Sponsored in part by Electric Power Research Inst.
(Contract W-7405-eng-48)
(DE82-011146; LBL-13467; CONF-820102-2) Avail: NTIS HC A03/MF A01

The development of an alloy suitable for use in the retaining rings of two-pole electrical generators is described. Three key properties were sought: a yield strength of 200 ksi or greater with good residual toughness; resistance to hydrogen embrittlement and stress corrosion cracking; and processability through heat treatment after hot forming, to avoid the necessity of cold forming of the ring. The principal alloy developed is an iron-based superalloy which is strengthened through the formation of cubic Beta' precipitates of composition Ni3(Ti,Ta,Al). When given appropriate aging treatment from the as-forged condition the alloy achieves yield strength in excess of 200 ksi with good residual toughness and promising resistance to cracking in gaseous hydrogen and salt water. The composition and processing of the alloy are the results of sequential metallurgical development, the steps of which are described. The alloy achieves high strength in thick sections while maintaining reasonable costs, melting practice, and hot formability. The nickel content of the alloy was adjusted to insure that the alloy would be paramagnetic austenite after aging reaction to form the Ni3X strengthening precipitates. Tantalum was included among the Beta'-forming elements to increase the lattice mismatch of the precipitate and improve alloy strength. Chromium was added to the composition to stabilize the austenite phase and eliminate stress corrosion cracking susceptibility due to martensitic transformation of the austenite. The Mo-V-B group was included to inhibit intergranular precipitation of the equilibrium Eta phase and hence suppress a tendency toward intergranular fracture in the alloy. DOE

N82-31530# Indian Inst. of Tech., Madras. Dept. of Civil Engineering.
FACTORS AND MECHANISMS OF STEEL CORROSION IN CONCRETE IN THE OCEAN ENVIRONMENT. PART 1: PRELIMINARY REPORT - LITERATURE SURVEY
S. Krishna Moorthy, S. K. Bhattacharya, and D. S. Sidhu Mar. 1981 54 p refs
(PB82-168014; TR-17) Avail: NTIS HC A04/MF A01 CSCL 11F

The corrosion of steel in reinforced concrete structures exposed to ocean environments is discussed. The electrochemical nature of corrosion is examined. Types of corrosion are discussed, as are factors which influence the corrosion of concrete embedded steel. Corrosion prevention is discussed. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-31531*# Rockwell International Corp., Pittsburgh, Pa. Space Div.
CONTAINERLESS PREPARATION OF ADVANCED OPTICAL GLASSES: EXPERIMENT 77F095 Final Report
R. A. Happe and K. S. Kim 1 Mar. 1982 160 p refs
(Contract NAS8-32953)
(NASA-CR-162073; NAS 1.26:162073; SSD82-0125) Avail: NTIS HC A08/MF A01 CSCL 11B

Containerless processing of optical glasses was studied in preparation for space shuttle MEA flight experiments. Ground based investigation, experiment/hardware coordination activities and development of flight experiment and sample characterization plans were investigated. In the ground based investigation over 100 candidate glass materials for space processing were screened and promising compositions were identified. The system of Nb2O5-TiO2-CaO was found to be very rich with containerless glass compositions and as extensive number of the oxides combinations were tried resulting in a glass formation ternary phase diagram. The frequent occurrence of glass formation by containerless processing among the compositions for which no glass formations were previously reported indicated the possibility and an advantage of containerless processing in a terrestrial environment. S.L.

N82-31532*# Massachusetts Inst. of Tech., Cambridge. Crystal Physics and Optical Electronics Lab.
PHOTOVOLTAIC EFFECT IN FERROELECTRIC CERAMICS Final Technical Report, 1 Sep. 1980 - 31 Oct. 1981
D. J. Epstein, A. Linz, and H. P. Jenssen Apr. 1982 62 p refs (Grant NAG1-98)
(NASA-CR-169287; NAS 1.26:169287) Avail: NTIS HC A04/MF A01 CSCL 11B

The ceramic structure was simulated in a form that is more tractable to correlation between experiment and theory. Single crystals (of barium titanate) were fabricated in a simple corrugated structure in which the pedestals of the corrugation simulated the grain while the intervening cuts could be filled with materials simulating the grain boundaries. The observed photovoltages were extremely small (<100 mv). S.L.

N82-31533*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemical Engineering.
NONEQUILIBRIUM MATERIAL EFFECTS ON THE BEHAVIOR OF POLYMERIC COMPOSITE MATRICES AND THEIR RELATED COMPOSITES Final Report
Garth L. Wilkes 2 Apr. 1982 37 p refs
(Grant NAG1-78)
(NASA-CR-169283; NAS 1.26:169286) Avail: NTIS HC A03/MF A01

The effects of physical aging on the material properties of some linear and network macromolecular glasses are discussed. The free volume concept is used to describe this behavior. The effect of physical aging on properties of some uniaxial graphite/fiber epoxy resin composites is investigated using stress relaxation in both tensile and flexural modes. The matrix polymers used were resins both of which are based on a 4,4-methylenedianiline derivative of epichlorohydrin with diamino diphenyl sulfone (DDS) as the curing agent. The matrix resin, as used in the practical application in composites, not fully cured and the glass transition of the network was dependent on the curing schedule. The physical aging of the bulk crosslinked epoxy was found to depend on the annealing temperature, and the T sub g of the resin. The physical aging of the composite, monitored by the stress relaxation method, was found to be dependent on the testing direction. S.L.

N82-31534*# Podlaseck (Stanley E.), Lompoc, Calif.
NONMETALLIC MATERIALS HANDBOOK. VOLUME 2: EPOXY AND SILICONE MATERIALS Final Report
Stanley E. Podlaseck Washington NASA Jul. 1982 308 p
(Contract NAS1-15133)
(NASA-CR-3588; NAS 1.26:3588) Avail: NTIS HC A14/MF A01 CSCL 11G

Chemical and physical property test data obtained during qualification and receiving inspection testing of nonmetallic materials for the Viking Mars Lander program is presented. Thermochemical data showing degradation as a function of temperature from room temperature through 773 K is included. These data include activation energies for thermal degradation, rate constants, and exo- and/or endotherms. Thermal degradations carried out under vacuum include mass spectral data taken simultaneously during the decomposition. Many materials have supporting data such as condensation rates of degassed products and isothermal weight loss. Changes in mechanical, electrical, and thermal properties after exposure to 408 K in nitrogen for times ranging from 380 to 570 hours are included for many materials. S.L.

N82-31535# Honeywell Corporate Technology Center, Bloomington, Minn.
STUDY OF MECHANO-CHEMICAL MACHINING OF CERAMICS AND THE EFFECT ON THIN FILM BEHAVIOR Annual Technical Report, 1 May 1980 - 30 Apr. 1981
H. Vora and R. J. Stokes Jun. 1981 38 p refs
(Contract N00014-80-C-0437)
(AD-A112574) Avail: NTIS HC A03/MF A01 CSCL 11/2

Efforts were made to finish the surfaces of single-crystal MgO, Si, and both single-crystal and tape-cast Al2O3 using the technique of mechano-chemical polishing. In this technique, the emphasis is on employing an abrasive whose hardness is less than that of the workpiece to produce damage and scratch free surfaces that are also flat. An evidence for mechano-chemical polishing in the form of scratch free surfaces was not obtained in the case of MgO, which was polished using talc, rock salt, calcite, and fluorite as abrasives. The mechano-chemical polishing effects, however, were readily observed when Si was polished using CaCO3, BaCO3, and MgO as abrasives, and when Al2O3 was polished on a plate of window glass using no abrasive. Mechano-chemically polished surfaces were characterized using RHEED, profilometry, interferometry, optical microscopy, and electron spectroscopy for chemical analysis. Author (GRA)

N82-31536# Wisconsin Univ., Madison. Mathematics Research Center.
SINGULARLY PERTURBED HYPERBOLIC EVALUATION PROBLEMS WITH INFINITE DELAY AND AN APPLICATION TO POLYMER RHEOLOGY
Michael Renardy May 1982 32 p refs
(Contract DAAG29-80-C-0041)
(AD-A116212; MRC-TSR-2377) Avail: NTIS HC A03/MF A01 CSCL 20/4

We prove an existence theorem locally in time for quasilinear hyperbolic equations, in which the coefficients are allowed to depend on the history of the dependent variable. Singular perturbations, which change the type of the equation to parabolic, are included, and continuous dependence of the solutions on the perturbation parameter is shown. It is demonstrated that, for a substantial number of constitutive models suggested in the literature, the stretching of filaments of polymeric liquids is described by equations of the kind under study here. Author (GRA)

N82-31537# Naval Research Lab., Washington, D. C. Inorganic and Electrochemistry Branch.
CURRENT HYDRAULIC FLUIDS RESEARCH IN THE DEPARTMENT OF DEFENSE Final Report
R. A. DeMarco 7 Jul. 1982 18 p
(RR0130243)
(AD-A116326; NRL-MR-4844) Avail: NTIS HC A02/MF A01 CSCL 11/8

A survey was conducted to determine the current and antici-

pated direction of hydraulic fluid research in the Department of Defense (DoD). The principal emphasis currently in each DoD Service is to adapt the Air Force tested, commercially available, halogenated alkanes and halogenated alkyl ethers as nonflammable hydraulic fluids. The use of these materials in Navy systems presents significant problems due to their high density, cost, and potential lack of compatibility with materials in current systems. The development of new fluids for present systems is seriously hampered by their anticipated overall cost, and with the exception of the Air Force, which is looking toward future systems, the development of new fluids is not expected to be a major direction in other DoD laboratories. GRA

N82-31538# Lockheed-Georgia Co., Marietta.
DAMAGE PROGRESSION IN GRAPHITE-EPOXY BY A DEPLYING TECHNIQUE Final Report, Jun. 1980 - Dec. 1981
S. M. Freeman Wright-Patterson AFB, Ohio AFWAL Dec. 1981 515 p refs
(Contract F33615-80-C-3224; AF Proj. 0100; AF Proj. 2401)
(AD-A116120; LG-81ER0245; AFWAL-TR-81-3157) Avail: NTIS HC A22/MF A01 CSCL 11/4

Open hole and mechanically fastened joint specimens employing three different symmetric stacking sequences were used for this project. Replicates for each specimen type and stacking sequence were loaded to ultimate and four load levels below ultimate to produce specimens containing progressive amounts of damage. During loading of each specimen Acoustic Emissions (AE) were monitored as a function of load. Specimens from each of the four load levels were inspected for matrix cracking, delamination and fiber bundle fractures using penetrant enhanced X-ray radiography and the deply technique. The deply technique, a unique but destructuve inspection method, was used to separate the graphite-epoxy composite into its individual laminae while maintaining the integrity of each lamina. With the application of a gold chloride penetrant before deplying, the internal matrix damage as well as fiber bundle fracture could be readily observed on the surface of the individual laminae. These damage observations were recorded on a Lamina Damage Characterization Chart for each specimen. These charts contain pictoria sketches, with fiber orientations shown, for each lamina of the specimen segment deplied. A summmary of the inspection results including photomacrographs of typical observed damage along with examples of charted damage is presented in the main body of the report. GRA

N82-31539# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
IN-SITU MEASUREMENT OF THE PROPERTIES OF CURING SYSTEMS WITH MICRODIELECTROMETRY Technical Report, Jun. 1981 - Apr. 1982
S. D. Senturia, N. F. Sheppard, Jr., H. L. Lee, and David R. Day 4 May 1982 39 p refs Presented at the Adhesion Soc. Meeting, Mobile, Ala., Feb. 1982 Submitted for publication
(Contract N00014-78-C-0591; NR Proj. 356-691)
(AD-A116474; TR-4) Avail: NTIS HC A03/MF A01 CSCL 11/9

This paper reports the measurement of low frequency dielectric properties of several epoxy-amine systems undergoing cure. Results from isothermal cures of DGEBA-MPDA are shown to provide a measurement of a low-frequency relaxation time that can be correlated with bulk viscosity prior to gelation. Also studied was the effect of PGE diluent in the DGEBA-DDS system. It is shown that as little as 5 phr diluent produces observable changes in the low-frequency dielectric properties. Author (GRA)

N82-31540# California Univ., Livermore. Lawrence Livermore Lab.
NEODYMIUM FLUORESCENCE IN GLASS: COMPARISON WITH COMPUTER SIMULATIONS OF GLASS STRUCTURE
S. A. Brawer and M. J. Weber 12 Jun. 1981 5 p refs Presented at the Intern. Conf. on Luminescence, Berlin, 20 Jul. 1981
(Contract W-7405-eng-48)
(DE82-003177; UCRL-86187; CONF-810769-1) Avail: NTIS HC A02/MF A01

Linewidths and intensities in the absorption and emission spectra of Nd3+ have been measured in a large number of beryllium fluoride glasses and are found to vary systematically with composition. To account for these variations, we have simulated the atomic structure at Nd3+ sites by molecular dynamics methods and used a point charge model to predict relative energy levels. For simple beryllium fluoride glass and alkali and alkaline earth fluoroberyllate glasses, the predicted average energy levels of the F/sub 3/2/ state are in general agreement with experiment. DOE

N82-31541# Oak Ridge National Lab., Tenn.
MATERIALS FOR HIGH-TEMPERATURE CERAMIC HEAT EXCHANGERS
V. J. Tennery and P. F. Becher 1981 14 p refs Presented at 6th Ann. Conf. on Mater. for Coal Conversion and Utilization, Gaithersburg, Md., 13 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002874; CONF-811061-4) Avail: NTIS HC A02/MF A01

Five structural ceramics (NC-203 SiC, KT SiC, sintered a-SiC, NC-132 and NCX-34 were exposed to combustion products and slags of coal oil mixtures. Phase and flexural strength changes were determined. The role of impurities in the oxidation behavior of SiC and Si3N4 ceramics was also studied. DOE

N82-31542# Mound Lab., Miamisburg, Ohio.
CHARACTERIZATION OF RADIATION-CROSSLINKED, HIGH-DENSITY POLYETHYLENE
Ruth B. Whitaker, Stephen M. Craven, Donald E. Etter, Eugene F. Jendrek, and Allan Nease 1981 34 p refs Presented at the 9th DOE Compatibility Meeting, St. Petersburg, Fla., 27-29 Oct. 1981
(Contract DE-AC04-76DP-00053)
(DE82-002559; MLM-2874-OP; CONF-811076-3) Avail: NTIS HC A03/MF A01

Crystalline form stable, high density polyethylene (HDPE) pellets developed for thermal energy storage are studied. The crosslinked, form stable HDPE pellets produced by electron beam radiation crosslinking, and the effects of crosslinking on crystallinity and heat of fusion are considered. Calorimetric measurements of the heats of fusion (delta H sub f) of the radiation crosslinked HDPE (in dosages of 4 to 18 Mrad) showed that while a substantial decrease in delta H sub f occurred after the first melting cycle (up to approximately 25%), slow cooling (1.25 C/min) on recrystallization of the pellets could restore the delta H sub f value to 95% of that of the uncrosslinked HDPE up to 9.0 Mrad dosage exposure. The form stability of the 9.0 Mrad HDPE was very good even after 500 melt freeze cycles in ethylenes glycol. However, some further decline in delta H sub f was noted along with an increase in gel content at the end of the 500 cycles. DOE

N82-31543# Washington Univ., Seattle. Dept. of Chemistry.
RUBBER ELASTICITY Progress Report, 15 Jun. 1981 - 1 Feb. 1982
B. E. Eichinger 1981 8 p refs
(Contract DE-AT06-81ER-10912)
(DE-82011220; DOE/ER-10912/1) Avail: NTIS HC A02/MF A01

Progress on the following three projects is described: swelling of elastomers by diluents; theoretical analysis of the dynamics and thermodynamics of random networks; and synthesis of elastomers with metal-chelate crosslinkages. Five elastomer-solvent systems were investigated. In all cases polydimethyl siloxane was used with either cyclohexane or benzene or both. The comparison established the general validity of Flory's new constrained junction theory. However a slight revision of the theory was required. Theoretical work on amorphorous systems centered on evaluation of the density states for models (constructed by others) of amorphorus silicon, As2O3, etc. The utility of these models is being assessed. A batch of styrene-isoprene elastomer was prepared and is undergoing stress-strain measurements. DOE

N82-31544# Mound Lab., Miamisburg, Ohio.
INVESTIGATION OF HYBRID-PIN FEEDTHROUGHS AND DIRECT-BONDED-PIN FEEDTHROUGHS IN ELECTRONIC GRADE ALUMINA CERAMICS

Michael D. Kelly 12 Feb. 1982 25 p
(Contract DE-AC04-780P-00053)
(DE82-011238; MLM-MU-82-62-0003) Avail: NTIS HC A02/MF A01

Molybdenum alumina cermets are used to provide electrical feedthroughs in alumina substrates for several applications. Engineering techniques to insert metal pins through the alumina body, while the benefits of the cermet are maintained, were developed. In this two-step process, metal tubes (molybdenum) are inserted into holes drilled in a green Mo-Al2O3 cermet and sintered in place. Then, copper or Kovar metal pins are diffusion bonded in these tubes. Molybdenum and niobium pins were also investigated as potential electrical feedthroughs in alumina ceramic components. Ceramic powder was isostatically pressed around the metal pins prior to sintering. Reaction of the molybdenum and niobium with the ceramic matrix forms a strong bond. The metal pin hydrids form electrical feedthroughs in alumina ceramics that are more conductive, stronger, and require fewer processing steps than the present methods using cermet feedthroughs. DOE

N82-31545# National Bureau of Standards, Washington, D.C.
LOW TEMPERATURE MECHANICAL PROPERTIES OF A POLYURETHANE FOAM
J. M. Arvidson and L. L. Sparks Nov. 1981 18 p Sponsored in part by the Gas Research Inst.
(PB82-160441; NBSIR-81-1654) Avail: NTIS HC A02/MF A01 CSCL 11I

Polyurethane foam, having a density of 32 kg/cu m, was tested at 295, 111, 76, and 45 K in helium gas. The material properties reported are Young's modulus, proportional limit, yield strength (at 0.2% offset), tensile, shear, and compressive strengths, and elongation (elastic and plastic). To perform these tests, a unique apparatus was developed. This apparatus permits tension, compression, and shear testing of materials at any temperature ranging from 295 to 4 K. Strain is measured with a concentric, overlapping-cylinder capacitance extensometer that is highly sensitive and linear in output. Author (GRA)

N82-32066*# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
FLOCCULATION OF COLLOIDAL SOLS: DIFFUSION-CONTROLLED VS AGITATION-INDUCED FLOCCULATION
In Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 95-102 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 11G

N82-32067*# British Columbia Univ., Vancouver. Dept. of Pathology.
CELL PARTITION IN TWO PHASE POLYMER SYSTEMS
D. E. Brooks *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 104-115 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 11G

N82-32299# Joint Publications Research Service, Arlington, Va.
SWEDISH HIGH STRENGTH POLYETHYLENE FIBES DEVELOPED
In its West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 32-33 Transl. into ENGLISH from NY Tek. (Sweden), 28 Jan. 1982 p 46 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-31546*# Lockheed-California Co., Burbank.
ADDITIONAL EXPERIMENTS ON FLOWABILITY IMPROVEMENTS OF AVIATION FUELS AT LOW TEMPERATURES, VOLUME 2 Final Report
Francis J. Stockemer and Ronald L. Deane Aug. 1982 56 p refs
(Contract NAS3-21977)
(NASA-CR-167912; NAS 1.26:167912) Avail: NTIS HC A04/MF A01 CSCL 21D

An investigation was performed to study flow improver additives and scale-model fuel heating systems for use with aviation hydrocarbon fuel at low temperatures. Test were performed in a facility that simulated the heat transfer and temperature profiles anticipated in wing fuel tanks during flight of long-range commercial aircraft. The results are presented of experiments conducted in a test tank simulating a section of an outer wing integral fuel tank approximately full-scale in height, chilled through heat exchange panels bonded to the upper and lower horizontal surfaces. A separate system heated lubricating oil externally by a controllable electric heater, to transfer heat to fuel pumped from the test tank through an oil-to-fuel heat exchanger, and to recirculate the heated fuel back to the test tank. B.W.

N82-31547# Naval Postgraduate School, Monterey, Calif.
ADIABATIC COMPUTATION OF INTERNAL BLAST FROM ALUMINUM CASED CHARGES IN AIR Technical Report, Fiscal Years 1980-1981
Richard A. Reinhardt and Andrea K. McDonald China Lake, Calif. Naval Weapons Center Jan. 1982 34 p refs
(WF32300000)
(AD-A116681; AD-E450029; NWC-TP-6287) Avail: NTIS HC A03/MF A01 CSCL 19/1

Calculations have been carried out, using the HP9845A desktop computer, for the maximum overpressures developed by combustion of fuels plus aluminum in confined air volumes. N all, eight fuels were chosen, both conventional and explosive. The mass of fuel to that of metal was varied from 0.1 to 10.0 and the total concentration of fuel plus metal ranged from 0.1 to 10.0 kilograms per cubic meter of incident air. The computations include evaluation of the adiabatic temperatures and of the product compositions, the latter involving the chemical equilibria amongst 28 gaseous and up to five condensed-phase substances. GRA

N82-31548# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE EFFECTS OF SMOKE SUPPRESSANT FUEL ADDITIVES ON ENGINE AND TEST CELL EXHAUST GAS OPACITIES Final Report, 1981
Donald W. Thornburg, Thomas R. Darnell, and David W. Netzer May 1982 116 p refs
(AD-A116171; NPS67-82-004) Avail: NTIS HC A06/MF A01 CSCL 21/4

Tests were conducted in a one-eighth scale turbojet test cell with a ramjet type combustor to investigate the effects of fuel additives on smoke reduction. Particle size and mass concentrations were determined at the engine and stack exhausts using three wavelength optical detector systems. Particulate samples were also collected at the engine exhaust and analyzed with a scanning electron microscope. Combustor temperature and fuel additives were found to significantly affect particulate mass concentrations emitted from the engine while particle size appeared to be unaffected. No significant changes in the particulate size or mass occurred from the engine exhaust to the stack exhaust. The optical determination of exhaust mean particulate size/mass concentration with three wavelength optical detector systems appears to be reasonably accurate technique for evaluating the effects of engine and test cell operating conditions and fuel composition changes on the emitted particulates. Author (GRA)

N82-31549# Naval Weapons Center, China Lake, Calif. Ordnance Systems Department.
THERMAL STABILITY OF SIX CANDIDATE PROPELLANTS FOR AN AIR LAUNCHED TACTICAL MISSILE Technical Progress

Report, Nov. 1980 - Mar. 1981
Jack M. Pakulak, Jr. and Edward Kuletz Feb. 1982 32 p refs (WF31300000)
(AD-A116682; AD-E450034; NWC-P-6293) Avail: NTIS HC A03/MF A01 CSCL 21/9

The thermal stability patterns of six solid propellants of various types were determined by means of differential thermal analysis, thermogravimetric analysis, and derivative thermogravimetry. Differential scanning calorimeter data were also obtained. These data were then used to calculate the time to cook-off of the propellants. Examples show the necessity of considering self-heating effects when the heating times are long (i.e., slow cook-off rather than fast cook-off). The methods and techniques described can be used to predict cook-off time and temperature for other propellants. GRA

N82-31550# Gabrielson (James E.), Plymouth, Minn.
CATTAIL RHIZOME DERIVED ALCOHOL Final Report
Jan. 1982 36 p refs
(Contract DE-FG02-81AF-92016)
(DE82-007953; DOE/AF-92016/1) Avail: NTIS HC A03/MF A01

Alcohol production from cattail rhizomes is discussed. Over 60 fermentations were made and the conversion rates of the solid part of the rhizomes was very good. As much as 25 weight percent of rhizomes was converted. The alcohol concentration is only about 2% or less in the beer when the fermentation is complete. To obtain fuel grade alcohol from such material by conventional distillation requires much more energy than can be obtained by burning the alcohol. Either the fermentation must be carried out to produce a more concentrated product or the separation process must be improved. Based on the maximum land harvest rate and the best alcohol yield, production of 134 gallons of alcohol/acre of cattails is projected. DOE

N82-31551# Kansas Energy Office, Topeka. Energy Research and Resource Development Div.
POWER-GRADE BUTANOL RECOVERY AND UTILIZATION
Randall Noon 12 Feb. 1982 21 p refs
(Contract DE-FG47-81AF-93013)
(DE82-011212; DOE/AF-93013/T1) Avail: NTIS HC A02/MF A01

A two-fold program to demonstrate and test a power grade butanol-acetone-ethanol fuel recovery system, and further to demonstrate the feasibility of using the fuel blend in a standard type engine is described. A development program was initiated to design and test an operational power grade butanol recovery plant that would operate at one liter per hour output and test and assess the performance of power grade butanol in a spark ignition automotive engine. This project demonstrated that recovery of a power grade butanol fuel blend is simple and can be accomplished at a considered energy advantage over ethanol. It was further demonstrated that such a power grade blend works well in a typical spark ignition engine. DOE

N82-31552# Los Alamos Scientific Lab., N. Mex.
RADIOGRAPHIC STUDY OF IMPACT IN POLYMER BONDED EXPLOSIVES
Erik Fugelso, Jack D. Jacobson, Robert R. Karpp, and Russ Jensen (Hercules Corp.) 1981 9 p refs Presented at the Conf. on Shock Waves in Condensed Media, Menlo Park, Calif., 23 Jun. 1981 Submitted for publication
(DE82-002354; LA-UR-81-3024; CONF-eng-36) Avail: NTIS HC A02/MF A01

Computer tomography generated material density maps from flash X-ray radiographs of the impact of cylinders of mockup polymen bonded explosive (PBX) striking a steel plate. Comparison of the density fields with computer simulation allowed discrimination of rather complex deformation and flow models for insensitive explosives to be used in further studies of chemical reactions initiated by shock waves. DOE

N82-31553# Los Alamos Scientific Lab., N. Mex.
NUMERICAL MODELING OF INSENSITIVE HIGH EXPLOSIVES INITIATION
Allen L. Bowman and Charles L. Mader 1981 20 p refs
(Contract W-7405-eng-36)
(DE82-002358; LA-UR-81-3065; CONF-811099-1) Avail: NTIS HC A02/MF A01

The initiation of propagating, diverging detonation is usually accomplished by small conventional initiators. As the explosive to be initiated becomes more shock insensitive, the initiators must have larger diameters to be effective. Very shock insensitive explosives have required initiators larger than 2.5 cm. We have numerically examined the process of initiation of propagating detonation as a function of the shock sensitivity of the explosive using the two dimensional Lagrangian reactive hydrodynamic code 2DL and the Forest Fire rate to describe the shock initiation process of heterogeneous explosives. The initiation of propagating detonation in shock insensitive explosives containing triamino trinitrobenzene results in large regions of partially decomposed explosive even when initiated by large initiators. The process has been observed experimentally and reproduced numerically. DOE

N82-31554# California Univ., Livermore. Lawrence Livermore Lab.
CONTAINMENT OF EXPLOSIONS IN A REPOSITORY
Howard C. Hornig 10 Aug. 1981 10 p ref
(Contract W-7405-eng-48)
(DE82-001895; UCID-19219) Avail: NTIS HC A02/MF A01

Tests conducted on respositories (four drawer office safe files) to determine safe limits for storing small quantities of explosive showed that a repository provides very good protection from detonation of 10 grams of explosive, but that it is blown apart by detonation of 50 grams. DOE

N82-31555# California Univ., Livermore. Lawrence Livermore Lab.
THERMAL-DECOMPOSITION STUDIES OF HMX
John R. Kolb and Raul G. Garza 20 Oct. 1981 22 p refs Presented at the 9th DOE Compatibility Meeting, St. Petersburg, Fla., 27-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003320; UCRL-86093; CONF-811076-7) Avail: NTIS HC A02/MF A01

The rates of decomposition as functions of time and temperature on a combined thermogravimetric analyzer-residual gas analyzer were investigated. Decomposition products generated as the original HMX begins to decompose were identified. The temperature range studied was 50 to 200 C. The decomposition process and the nature of decomposition products as function of HMX polymorphs and conformations of the organic ring systems and possible reactive intermediates are discussed. DOE

N82-31556# Sandia Labs., Albuquerque, N. Mex.
REVIEW OF LARGE-SCALE FUEL-AIR EXPLOSION TESTS AND TECHNIQUES
W. B. Benedick 1981 48 p refs Presented at the Intern. Specialists Meeting on Fuel-Air Explosives, Montreal, 4 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-002422; SAND-81-2487C; CONF-811124-3) Avail: NTIS HC A03/MF A01

Tests involving large scale fuel-air explosions are reviewed. Aspects addressed include fuel type, detonation limits, initiation of detonation propagation, and heat fluence from burning fuel-air mixtures. DOE

N82-31557# Midwest Research Inst., Golden, Colo.
SOLAR DECOMPOSITION OF CADMIUM OXIDE FOR HYDROGEN PRODUCTION Final Subcontract Report
J. D. Schreiber, B. D. Yudow, R. H. Carty, T. P. Whaley, and J. B. Pangborn Nov. 1981 92 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-011092; SERI/TR-9-8325-1) Avail: NTIS HC A05/MF A01

The reactor developed for this study performed satisfactorily in establishing the feasibility of cadmium oxide decomposition under

the realistic conditions of the solar-furnace environment. The solar-furnace environment is very appropriate for the evaluation of design concepts. However, the solar furnace probably cannot give precise rate data. The flux is too nonuniform, so temperatures of reactant and corresponding reaction rates are also nonuniform. One of the most important results of this project was the recovery of samples from the quench heat exchanger that contained a surprisingly large amount of metallic cadmium. The fact that the sample taken from the quench heat exchanger was metallic in appearance and contained between 67% and 84% metallic cadmium would tend to indicate recombination of cadmium vapor and oxygen can be effectively prevented by the quenching operation. It would also tend to confirm recent studies that show cadmium oxide does not sublime appreciably. DOE

N82-31558# Oak Ridge National Lab., Tenn. Instrumentation and Controls Div.
STATE-OF-THE-ART ASSESSMENT OF COAL PREPARATION PLANT AUTOMATION
K. R. Car, G. O. Allgood, R. L. Anderson, W. H. Andrews, N. C. Bradley, C. H. Brown, G. S. Canright, G. M. Caton, W. R. Hamel, and J. T. Hutton Feb. 1982 199 p refs
(Contract W-7405-eng-26)
(DE82-011296; ORNL-5699) Avail: NTIS HC A09/MF A01

As the basis for a continuing program to optimize the performance of coal preparation plants through the application of modern instrumentation and controls technology, the state of the art in the industry was assessed. Coal preparation literature was surveyed comprehensively, coal preparation facilities were visited, and discussions were held with workers in the industry. The objective was to determine the feasibility of and need for increased automation, to identify areas where instrument development is needed, and to analyze characteristics of the coal industry relevant to further automation. The salient conclusions of the study are that the coal preparation industry in the United States derives little of the benefit available from instrumentation and controls technology and rapid recovery of capital investment will result from automation. An appreciable savings of a valuable energy resource can be effected through the orderly development of an automation program. Benefits due to improvements in control of coal preparation plants include an increased yield of clean coal, a reduced coal content in plant refuse, lower operating costs, lower equipment maintenance costs, and an improved ability to meet contract specifications. DOE

N82-31559# Oak Ridge National Lab., Tenn.
INTERNATIONAL SURVEY OF COAL PREPARATION TECHNOLOGY
J. C. Moyers and K. O. Johnsson Apr. 1982 73 p refs
(Contract W-7405-eng-26)
(DE82-009870; ORNL/TM-8207) Avail: NTIS HC A04/MF A01

A survey of the technology and coal preparation in foreign nations was conducted. The objectives were to determine the extent and practices of coal preparation, to identify new developments, and to identify problem areas that warrant additional research and development emphasis. The fraction of national hard coal production that is prepared ranges from less than 25% in China and India to more than 75% in Australia, Poland, and the United Kingdom. The same basic preparation processes and equipment are used worldwide, but there is a wide range in the complexity of preparation plants due to the differences in coal characteristics and market requirements. The most significant new development appears to be the introduction of modern control systems that utilize computers and on-line analytical instruments. The major problem facing the industry appears to be that of cleaning and dewatering fine coal. DOE

N82-31560# Southern Solar Energy Center Planning Project, Atlanta, Ga.
ALTERNATIVE FUELS STUDY: POINT-OF-USE COMPONENT
28 Dec. 1981 14 p Prepared for the Virginia Electric and Power Co.
(Contract DE-AC02-79CS-30166)
(DE82-009502; SSEC/SP-31297) Avail: NTIS HC A02/MF A01

A possible approach to conducting the point-of-use component of the Virginia Electric and Power Company (VEPCO) study of alternative fuels is outlined. Alternative measures for point-of-use application (specifically for the residential sector) include conservation, solar space conditioning and water heating, and heat pumps. An outline is presented of analytical and field work that will provide information on parameters affecting users, the utility, and the market. Six interdependent activities discussed are: performance analysis, market research, utility impact analysis, comparative analysis, strategy planning, and implementation. DOE

N82-31561# Camp, Dresser and McKee, Inc., Austin, Tex.
PROCESS CATALOG FOR SYNFUEL TECHNOLOGIES IN TEXAS
Sep. 1981 158 p refs Sponsored by the Water Resources Council and Texas Dept. of Water Resources
(PB82-159955; Rept-9331-110) Avail: NTIS HC A08/MF A01 CSCL 21D

Specific information are presented regarding the types of synfuel processes most likely to be developed in Texas. Included is descriptive information for processes to gasify and liquefy coal and lignite and to convert biomass to usable fuels. Process flow diagrams and narrative descriptions, material and energy balances, water requirements and wastewater quantities and qualities are presented. GRA

N82-31562# TRW, Inc., Redondo Beach, Calif.
DEVELOPMENT OF TECHNOLOGY FOR COALBED METHANE RECOVERY. PROGRAM PLANNING Final Report, Sep. 1980 - Jul. 1981
Alex Gillies and Arnold Snygg Jun. 1981 215 p refs
(Contract GRI-5080-321-0333)
(PB82-168436; GRI-81/0008.1) Avail: NTIS HC A10/MF A01 CSCL 21D

A program option for the development of technology for economic recovery of coalbed methane was developed. As a first step in the planning process, an assessment of technology currently used in the oil and gas industry was conducted to determine its suitability for use in recovery of methane from coalbeds. It was determined that the most limiting technology was stimulation of water and gas flow from the deeper, more gassy, coal formations. Twenty R&D projects addressing stimulation techniques and related topics were selected by the GRI and the GRI project advisors and plans for their conduct developed. These individual project plans were consolidated into a representative program plan option which describes how the individual stimulation tests can be integrated into three types of production scale tests each targeted at a particular class of coal formation. GRA

N82-31563# TRW, Inc., Redondo Beach, Calif.
DEVELOPMENT OF TECHNOLOGY FOR COALBED METHANE RECOVERY PROGRAM PLANNING: APPENDIX A: TECHNOLOGY OPTIONS Final Report
Dec. 1981 60 p ref
(PB82-169699; GRI-81/0008.2-App-A) Avail: NTIS HC A04/MF A01 CSCL 21D

Program planning for the technology development necessary for the efficient recovery of methane from coalbeds is discussed. The various options and techniques now available and used in the past are summarized. L.F.M.

N82-32269# Centre de Recherches du Bouchet, Vert de Petit (France). Direction technique Autopropulsion.
STUDY AND PERFECTION OF A SOLID PROPELLANT FOR RAMJET ENGINES [RECHERCHE ET MISE AU POINT D'UN PROPERGOL SOLIDE POUR STATO-FUSEE]
Jd. Berard, G. Doriath, and C. Perut *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 10 p refs In FRENCH
(For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

N82-32297# Joint Publications Research Service, Arlington, Va.
FRANCE TO TRY FUEL OIL COAL MIXTURE AS SUBSTITUTE FUEL
In its West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 23-24 Transl. into ENGLISH from Le Nouvel Econ. (France), 15 Feb. 1982 p 55 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-31564# Oak Ridge National Lab., Tenn. Solar and Special Studies Section.
EMERGENCY PROTECTION FROM AEROSOLS
G. A. Cristy and C. V. Chester Jul. 1981 50 p refs
(Contract W-7405-eng-26)
(ORNL-5519) Avail: NTIS HC A03/MF A01

Expedient methods were developed that could be used by an average person, using only materials readily available, to protect himself and his family from injury by toxic radioactive aerosols. The most effective means of protection was the use of a household vacuum cleaner to maintain a small positive pressure on a closed house during passage of the aerosol cloud. Protection factors of 800 and above are achieved. R.J.F.

N82-31565# Naval Civil Engineering Lab., Port Hueneme, Calif.
INTERACTION OF ANCHORS WITH SOIL AND ANCHOR DESIGN Final Technical Note, Jan. 1977 - Jan. 1981
Robert J. Taylor Apr. 1982 50 p refs
(YF59556091)
(AD-A116597; NCEL-TN-1627) Avail: NTIS HC A03/MF A01 CSCL 13/10

The report provides a practical up-to-date guide that enables the practicing engineer to select and size common anchor types, including direct-embedment anchors, deadweight anchors, drag-embedment anchors, and pile anchors. For each anchor type, the report includes site survey recommendations, a brief description of various anchors within each anchor category, methods for determining anchor performance, and, in certain cases, suggestions for improving poor anchor behavior. Sources for additional information are suggested where the treatment of a broad topic is necessarily limited. Author (GRA)

N82-31566# Los Alamos Scientific Lab., N. Mex.
CHARACTERIZATION OF SPHERICAL SURFACES
Allen L. Gauler 1982 29 p refs Presented at the Metrology and Properties of Eng. Surfaces Intern. Conf., Leicester, England, Apr. 1982
(Contract W-7405-eng-36)
(DE82-002366; LA-UR-81-3001; CONF-820405-1) Avail: NTIS HC A03/MF A01

The surface geometry of a spherical object is often incompletely evaluated because of limitations inherent in the techniques used to measure it. If several techniques measuring different aspects of the surface are combined, a more complete description can be obtained. DOE

N82-31567# Los Alamos Scientific Lab., N. Mex.
ANALYSIS OF LIQUEFACTION OF HELIUM USING MAGNETIC REFRIGERATORS
J. A. Barclay Dec. 1981 31 p refs
(Contract W-7405-eng-36)
(DE82-007884; LA-8991; UC-38) Avail: NTIS HC A03/MF A01

A concept for a helium liquefier based on the magnetocaloric effect is introduced. A second-law analysis of a model liquefier is described. The calculations predict that efficiencies of approximately 50% of Carnot are probable. Magnetic liquefiers and gas refrigerators are compared briefly. DOE

N82-31568# California Univ., Berkeley. Lawrence Berkeley Lab.
DETERMINATION OF THE DYNAMIC PERFORMANCE OF WALLS
M. H. Sherman, R. C. Sondregger, and J. W. Adams Nov. 1981 29 p refs Presented at the Semiannual Meeting of the Am. Soc. of Heating, Refrigerating and Air Conditioning Engr., Houston, Tex., 24 Jan. 1982
(Contract W-7405-eng-48)
(DE82-007613; LBL-13510; CONF-820112-2) Avail: NTIS HC A03/MF A01

Measuring the thermal performance of walls in situ poses two separate problems: (1) how to measure time-varying surface temperatures and heat fluxes on both sides of the test wall; and (2) how to reduce this data set into a minimal number of parameters that effectively characterize the wall. A methodology is presented for interpreting field measurements of wall performance and an instrument developed for carrying out such measurements is described. The method is a simplified dynamic model that uses a small number of simplified thermal parameters (STP) a steady state conductance, a time constant and a few surface storage terms to describe the thermal performance of a wall. This model simulates actual wall performance by comparing model predictions with results generated from conventional response factor methods. The instrument developed for field measurements is the envelope thermal test unit (ETTU), which consists of two four-foot by six-foot blankets placed on either side of the test wall that are used to both measure and control the surface heat fluxes and surface temperatures of the wall. During a typical test, which lasts about 12 hours, one blanket imposes a specified flux through one surface of the test wall while the resulting heat flux on the other surface and the surface temperatures on both sites are measured. The model can be used for both laboratory and field measurements and may be applied to any component of the building envelope. DOE

N82-31569# Southampton Univ. (England). Inst. of Sound and Vibration Research.
[ACTIVITIES OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH] Annual Report, Mar. 1982
1982 49 p refs
Avail: NTIS HC A03/MF A01

Research in fluid dynamics, acoustics, automotive engineering, audiology, noise and vibration effects (on human beings), and structural response to noise and vibration was carried out. Aircraft noise, acoustics of flow duct systems and enclosures, acoustic modeling, sound propagation, and acoustic measurement techniques were studied. Auditory and vestibular functions and electrophysiology were investigated. Author (ESA)

N82-31570# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
[ACTIVITIES OF THE METAL MANUFACTURING RESEARCH CENTER] Annual Report, 1981 [RAPPORT ANNUEL DU COMITE PERMANENT AU CONSEIL GENERAL DU 16, JUIN 1982]
1981 38 p refs In FRENCH
Avail: NTIS HC A03/MF A01

Research work performed on casting, bridges, frameworks, boilermaking, mechanical construction, computer and automation techniques, and plastic working is summarized. Subjects include computer assisted design and manufacture, industrial robots with video capabilities, cryogenics materials, fatigue behavior of large girders and welding. Author (ESA)

N82-31571# Technische Hogeschool, Delft (Netherlands). Lab. of Refrigeration and Indoor Climate Technology.
ABSORPTION REFRIGERATION MACHINES Ph.D. Thesis
C. Keizer Apr. 1982 225 p refs
(WTHD-144) Avail: NTIS HC A10/MF A01

The performance of liquid ammonia absorption machines operating under marginal conditions, e.g., powered by solar or waste heat, was assessed. Computerized simulation shows that single-stage machines perform better than two-stage machines.

Experimental comparison of vertical tubular bubble absorbers and film absorbers shows that the heat transfer coefficient of the former can exceed that the latter by a factor of two or more. Bubble absorbers can be two times smaller than film ones. Bubble absorbers enable operation nearer to equilibrium conditions than film absorbers. Absorber height should be limited to 1m.
Author (ESA)

N82-31572# Tetra Tech, Inc., Pasadena, Calif.
NUMERICAL MODEL LANDSLIDE-GENERATED WAVES
Wen-Li Chiang, David Divrky, Peter Parnicky, and Wayne Weir Nov. 1981 276 p refs
(Contract DI-0-07-81-S0134)
(PB82-158296; TETRAT-T-3427) Avail: NTIS HC A13/MF A01 CSCL 13B

A computer program was developed for the propagation of waves throughout a reservoir using finite difference methods. Waves may be generated within the code by using one of two landslide descriptions or a fault displacement under the reservoir. The two landslide descriptions allow the code to generate velocity time relationships or the user to input slide strips with individual velocity time relationships. The theory used, a user's guide, examples and a listing are given. GRA

N82-31573# California State Dept. of Transportation, Sacramento. Office of Transportation Lab.
INSTRUMENTS FOR DETERMINING STRESS DISPLACEMENTS IN SOILS Final Report
Kenneth A. Jackura and Joseph B. Hannon Jul. 1981 119 p refs
(PB82-162470; Rept-632954; FHWA/CA/TL-81/09) Avail: NTIS HC A06/MF A01 CSCL 13B

The basic theory, design, and construction of a 10-inch diameter soil pressure cell are discussed. Finite element analytical techniques were used in assessing various cell geometric shapes that would minimize registration error regardless of cell orientation to the major principal stress. Approximately 170 cells of an optimum geometric shape were used in the evaluation of soil stresses around a buried culvert and its composite embankment. Their output data are considered and the device is compared to three types of other commercially available soil and interface pressure cells installed in conjunction with this model. Calibration procedures are also discussed. The design and construction of a continuous settlement profile gage composed of a transducer sensing head and a horizontally placed 2-inch diameter plastic pipe are also examined. The transducer is pulled through the pipe by means of cable raceway. Water within the pipe provides the static reference head for all settlement measurements. Accuracy is plus or minus 0.05 ft of settlement. Field performance of the device is included. GRA

N82-31574# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Computer-Aided Manufacturing.
COMMITTEE ON COMPUTER AIDED MANUFACTURING: REPORT ON ACTIVITIES Final Report, Jan. 1980 - Jun. 1981
1981 53 p
(Contract E49620-78-C-0027)
(PB82-162348) Avail: NTIS HC A04/MF A01 CSCL 13H

Various topics related to computer aided manufacturing are discussed. A review of the Air Force program on integrated computer-aided manufacturing is given. Strategies for technology transfer are discussed. Human factors, portability, and an economic analysis of the benefits of computer aided manufacturing are discussed. GRA

N82-31575# National Bureau of Standards, Washington, D.C. National Engineering Lab.
THE INTERNATIONAL SYSTEM OF UNITS (SI)
David T. Goldman, ed. and R. J. Bell, ed. (National Physical Lab., Teddington, England) Dec. 1981 57 p Transl. into ENGLISH of the mono. "Le Systeme International d'Unites (SI)" Paris, BIPM, 1981
(PB82-154584; NBS-SP-330) Avail: NTIS HC A04/MF A01 CSCL 14B

An exposition of a coherent system of units, a definition of supplementary units, a new definition of the base unit, the candela, and a new unit of dose equivalent, the sievert are given in this discussion of measurement. GRA

N82-31576# California Univ., Berkeley. Earthquake Engineering Research Center.
STUDIES ON EFFECTS OF INFILLS IN SEISMIC RESISTANT R/C CONSTRUCTION
S. T. Brokken and V. V. Bertero Oct. 1981 191 p refs
(Grant NSF PFR-79-08984)
(PB82-166190; UCB/EERC-81/12; NSF/CEE-81046) Avail: NTIS HC A09/MF A01 CSCL 13M

Experimental and analytical studies of the quantitative effects of infills in the seismic performance of buildings (particularly in buildings whose structural systems are based on the use of moment resisting frames alone are summarized); and the implications of these effects regarding the design of new buildings and retrofitting of existing R/C frame structures were evaluated. The first part is concerned with the infill problem and the experimental investigation conducted to study the effects of infill panels on seismic response of reinforced concrete frames. This investigation consisted of a series of quasi-static cyclic and monotonic load tests on 1/3-scale models of the lower 3-1/2 stories of an 11 story-three bay reinforced concrete frame infilled in the outer two bays. The reinforced concrete moment frame was designed for high rotational ductility and resistance to degradation under reversed cyclic shear loads. GRA

N82-31577# California Univ., Berkeley. Earthquake Engineering Research Center.
EXPERIMENTAL STUDY OF LEAD AND ELASTOMERIC DAMPERS FOR BASE ISOLATION SYSTEMS
James M. Kelly and Stuart B. Hodder Oct. 1981 88 p refs Sponsored in part by the New Zealand National Research Advisory Council
(Grant NSF PFR-79-08257)
(PB82-166182; UCB/EERC-81/16) Avail: NTIS HC A05/MF A01 CSCL 13M

A base isolation system which incorporated multilayer isolation bearings of polychloroprene rubber was involved in a series of experiments. Several forms of isolation system using the same basic bearing design but including inserts of different materials in a central hole in each bearing were studied. The inserts were used to enhance the damping properties of the system and to improve the response. The results indicate that there are no difficulties in designing an effective isolation system in polychloroprene rubber and that the multilayer elastomeric bearings can substantially reduce the seismic loads experienced by a building and its contents. Elastomeric inserts were effective in improving the response only to a limited extent. The use of lead inserts to enhance the damping was very effective in controlling the displacement. GRA

N82-31578# Earthquake Engineering Research Inst., Berkeley, Calif.
EVALUATION OF SEISMIC DESIGN PROVISIONS FOR MASONRY IN THE UNITED STATES
Bjorn Ingi Sveinsson, Ronald L. Mayes, and Hugh D. McNiven Aug. 1981 173 p refs Sponsored in part by Masonry Inst. of America Western States Clay Products Association, and Concrete Masonry Association of California and Nevada
(Grant NSF PFR-79-08251)
(PB82-166075; NSF/CEE-81041) Avail: NTIS HC A08/MF A01 CSCL 13M

An evaluation of two sets of seismic design provisions for masonry construction in the United States, namely, the 1979 Uniform Building Code and the ATC-3-06 Tentative Provisions for the Development of Seismic Design Regulations for Building is given. The method of evaluation is based on an overdesign ratio which compares the shear wall area required to resist code loads

with that required to resist realistic earthquake loads. The latter area is determined from test results from continuing masonry research program. A summary of the test results is included. A comparison of the shear wall areas required by the two sets of seismic provisions are given, and changes to both sets of provisions are suggested. Author (GRA)

N82-31579# Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Ingenieria

OPTIMIZATION OF STRUCTURAL SHAPES

Augusto J. Durelli (National Autonomous Univ. of Mexico) Apr. 1981 99 p refs Transl. into ENGLISH of Mono. "Optimacion de Formas Estructurales" Mexico City, Apr. 1981 Sponsored in part by National Autonomous Univ. of Mexico, Navy, and NSF (PB82-159922; Rept-437) Avail: NTIS HC A05/MF A01 CSCL 13M

The direct design of shapes of two dimensional structures, loaded in their plane, within specified design constraints and exhibiting optimum distribution of stresses is studied. Photoelasticity and a large field diffused polariscope is used. The optimization process involves the removal of material (with a hand file or router) from the low stress portions of the hole boundary of the model till an isochromatic fringe coincides with the boundary both on the tensile and compressive segments. Applications are also shown to the design of dove tails and slots in turbine blades and rotors, and to the design of star shaped solid propellant grains for rockets, both for the case of parallel side rays and enlarged tip of rays. The use of other methods, in particular the method using finite elements, to optimize structural forms is discussed. GRA

N82-31580# Purdue Univ., Lafayette, Ind. School of Civil Engineering.

SPERIL 1 - COMPUTER BASED STRUCTURAL DAMAGE ASSESSMENT SYSTEM

M. Ishizuka, K. S. Fu, and J. T. P. Yao Nov. 1981 44 p (Grant NSF PFR-79-06296)
(PB82-158460; CE-STR-81-36; NSF/CEE-81075) Avail: NTIS HC A03/MF A01 CSCL 13M

Implementation of the SPERIL program (version 1), a computer based damage assessment system of existing structures which are subjected to earthquake excitation, is outlined. To obtain the classification of damage states, SPERIL can be used to interpret observation data including the results of analyzing accelerometer records and on site visual inspection. An explanation of short term memory is provided and the control and rule based inference flow of SPERIL is examined. An explanation is given of the whole program configuration which consists of three separate files. A source program is included in the appendix. GRA

N82-31581# National Bureau of Standards, Washington, D.C. Center for Fire Research.

FINITE DIFFERENCE CALCULATIONS OF BUOYANT CONVECTION IN AN ENCLOSURE. PART 1: THE BASIC ALGORITHM Final Report

Howard R. Baum, Ronald G. Rehm, P. Darcy Barnett, and Daniel M. Corley Dec. 1981 69 p refs
(PB82-154386; NBSIR-81-2385) Avail: NTIS HC A04/MF A01 CSCL 13L

A novel mathematical model of buoyant convection in an enclosure, developed earlier, is solved by finite difference techniques in the two-dimensional case. This model has been developed as a principal analytical tool for the prediction of the movement of smoke and hot gases in fires. Effects of large density variations caused by substantial heating are retained while acoustic (high-frequency) waves, which are unimportant to buoyant convection, are analytically filtered out. No viscous or thermal conduction effects are included in the model. These two characteristics (filtering and no dissipative effects) distinguish the model from all others describing buoyant convection. The mathematical model consists of a mixed hyperbolic and elliptic set of non-linear partial differential equations: the problem is a mixed initial, boundary value one. An explicit time-marching algorithm, second-order accurate in both space and time, is used to solve the equations. The computational procedure uses a software package for solving a nonseparable elliptic equation developed especially for this problem. GRA

N82-31582# National Bureau of Standards, Washington, D.C. Center for Fire Research.

SMOKE MOVEMENT AND SMOKE CONTROL ON MERCHANT SHIPS Final Report

John H. Klote and Richard H. Zile Jan. 1982 70 p refs Sponsored in part by Coast Guard
(PB82-165192; NBSIR-81-2433) Avail: NTIS HC A04/MF A01 CSCL 13J

The basic concepts of smoke movement and smoke control with emphasis upon shipboard applicability are discussed. A report of simulated smoke movement tests performed on two merchant vessels is presented. Based upon these test results potential methods of smoke control for merchant vessels are discussed. Recommendations are made for future study. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-31583* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

RANDOM DIGITAL ENCRYPTION SECURE COMMUNICATION SYSTEM Patent

George D. Doland, inventor (to NASA) (Lockheed Electronics Co., Houston, Tex.) Issued 27 Jul. 1982 8 p Filed 28 Apr. 1978 Supersedes N78-25274 (16 - 16, 2101) Sponsored by NASA
(NASA-Case-MSC-16462-1; US-Patent-4,341,925; US-Patent-Appl-SN-900841; US-Patent-Class-178-22.17; US-Patent-Class-178-22.16; US-Patent-Class-375-106; US-Patent-Class-364-717) Avail: US Patent and Trademark Office CSCL 17B

The design of a secure communication system is described. A product code, formed from two pseudorandom sequences of digital bits, is used to encipher or scramble data prior to transmission. The two pseudorandom sequences are periodically changed at intervals before they have had time to repeat. One of the two sequences is transmitted continuously with the scrambled data for synchronization. In the receiver portion of the system, the incoming signal is compared with one of two locally generated pseudorandom sequences until correspondence between the sequences is obtained. At this time, the two locally generated sequences are formed into a product code which deciphers the data from the incoming signal. Provision is made to ensure synchronization of the transmitting and receiving portions of the system. Official Gazette of the U.S. Patent and Trademark Office

N82-31584*# NTL, Inc., Colmmack, N.Y.

A NEW ANTENNA CONCEPT FOR SATELLITE COMMUNICATIONS

G. Skahill and D. Ciccolella Jun. 1982 111 p refs
(Contract NAS3-22887)
(NASA-CR-167924; NAS 1.26:167924) Avail: NTIS HC A06/MF A01 CSCL 20N

A novel antenna configuration of two reflecting surfaces and a phased array is examined for application to satellite communications and shown to be superior in every respect to earlier designs for service to the continental United States from synchronous orbit. The vignetting that afflicts other two reflector optical systems is eliminated by use of a reflecting field element. The remaining aberrations, predominantly coma, are isolated in the time delay distribution at the surface of the array and can be compensated by ordinary array techniques. The optics exhibits infinite bandwidth

and the frequency range is limited only by the design of the array. Author

N82-31585*# Case Western Reserve Univ., Cleveland, Ohio. Inst. of Technology
COAXIAL PRIME FOCUS FEEDS FOR PARABOLOIDAL REFLECTORS
R. E. Collin, H. Schilling, and L. Hebert Jul. 1982 138 p refs (Contract NAS3-22342)
(NASA-CR-167934; NAS 1.26:167934) Avail: NTIS HC A07/MF A01 CSCL 20N

A TE11 - TM11 dual mode coaxial feed for use in prime focus paraboloidal antenna systems is investigated. The scattering matrix parameters of the internal bifurcation junction was determined by the residue calculus technique. The scattering parameters and radiation fields of the aperture were found from the Weinstein solution. The optimum modeing ratio for minimum cross-polarization was determined along with the corresponding optimum feed dimensions. A peak cross-polarization level of -58 dB is predicted. The frequency characteristics were also investigated and a bandwidth of 5% is predicted over which the cross-polarization remains below -30 dB, the input VSWR is below 1.15, and the phase error is less than 10 deg. Theoretical radiation patterns and efficiency curves for a paraboloidal reflector illuminated by this feed were computed. The predicted sidelobe level is below -30 dB and aperture efficiencies greater than 70% are possible. Experimental results are also presented that substantiates the theoretical results. In addition, experimental results for a 'short-cup' coaxial feed are given. The report includes extensive design data for the dual-mode feed along with performance curves showing cross-polarization as a function of feed parameters. The feed is useful for low-cost ground based receiving antennas for use in direct television satellite broadcasting service. Author

N82-31586# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
FREQUENCY MANAGEMENT ENGINEERING PRINCIPLES SPECTRUM MEASUREMENTS (REFERENCE ORDER 6050.23) Final Report
Joseph D. Fretz Aug. 1982 71 p refs
(FAA Proj. 213-460-390)
(DOT/FAA/RD-81/81) Avail: NTIS HC A04/MF A01

Federal Aviation Administration personnel are frequently involved in the resolution of interference complaints. The skillful use of measurement equipment can be essential to the successful resolution of such complaints. This report provides a summary of the spectrum measurement techniques applicable to Federal Aviation Administration facilities using the radio frequency spectrum. It is oriented toward electromagnetic compatibility measurements made by frequency management engineers but is of interest to anyone involved in radio frequency measurements. Author

N82-31587# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CONFIGURATION OF A LOW CAPACITY SCPC FM GROUND STATION FOR 6/4 GHz [CONFIGURACAO DE UMA ESTACAO TERRENA SCPC FM DE BAIXA CAPACIDADE PARA 6/4 GHz]
Helcio Aranha Mar. 1982 36 p refs In PORTUGUESE
(INPE-2350-NTE/182) Avail: NTIS HC A03/MF A01

The mechanical configuration of the frames (drawers) for the receiver, transmitter, input and power divider, channel units, and ventilation modules which compose the racks for the SCPC ground station is described. The installation of the frames into the rack is described. The front and back panels of the frames and the coaxial cables and interconnections between the frames are also described. J.D.

N82-31588# Royal Aircraft Establishment, Farnborough (England).
SPINE: COMMUNICATIONS EARTH STATION OPERATING PROCEDURES
K. Green Mar. 1982 37 p refs
(RAE-TM-SPACE-300; BR83034) Avail: NTIS HC A03/MF A01

Operating procedures for a satellite ground station, consisting of data terminal, channel synchronizer, computer interface module and SEL 32/77 link driving computer are presented. Switch on, interconnection cables, parameter setting, link driving computer operating system, communications software operation, and ground station shutdown are covered. Author (ESA)

N82-31589# Rome Air Development Center, Griffiss AFB, N.Y.
TROPOSPHERIC REFRACTION CORRECTIONS USING EXOATMOSPHERIC SOURCES Report, Apr. - Nov. 1981
Edward E. Altshuler and Koichi Mano Jan. 1982 21 p refs
(AF Proj. 4600)
(AD-A115422; RADC-TR-82-7) Avail: NTIS HC A02/MF A01 CSCL 20/14

The performance of radar and navigation systems that operate at low elevation angles is often limited by tropospheric refraction, which produces two main effects on radio waves, angular bending and range error. These errors increase with decreasing elevation angle and are of the order of 0.7 deg. and 100 m respectively near the horizon. For some locations, and for many applications, antenna pointing corrections based on surface refractivity are adequate for elevation angles above a few degrees. However, new systems which operate at elevation angles near the horizon require improved accuracies. A technique for obtaining angle error corrections by utilizing exo-atmospheric calibration sources, such as radio or satellites, has been reported. In this report, a sensitivity analysis of this technique established the accuracies possible for angle and range error corrections. Three types of errors limit the accuracy of these corrections: measurement errors, computational errors, and errors in estimating distances. The parameters to be measured are the apparent elevation angle of the calibration source and the surface index of refraction. One integral must be evaluated numerically to calculate the range error. Finally, the radius of the Earth, the heights of the target and calibration source, and a residual range error that arises because the calibration source cannot be tracked to zenith must be estimated. GRA

N82-31590# M/A-COM LINKABIT, Inc., San Diego, Calif.
EARTH STATION INTERFACE FOR DEMAND ASSIGNMENT APPLICATIONS Quarterly Technical Report, 1 Jan. - 31 Mar. 1982
31 Mar. 1982 66 p
(Contract MDA903-81-0636; ARPA Order 3674)
(AD-A115531) Avail: NTIS HC A04/MF A01 CSCL 22/2

The LCC36A (Interface Control and Codec Unit) has two Control and Interface Processor (CIP) cards. These cards have been redesigned to be identical with respect to the hardware. Only the software will distinguish between the uplink CIP and the downlink CIP. Author (GRA)

N82-31591# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
MILLIMETER WAVE ELECTROMAGNETIC MEASUREMENT TECHNIQUES Final Report, 1 Sep. 1980 - 30 Apr. 1982
E. E. Donaldson, J. C. Mantovani, G. B. Melson, and D. W. Acree May 1982 148 p refs
(Contract DAAK80-80-C-0569; DA Proj. 1L1-62701-AH-92)
(AD-A116369; GIT-A-2746-F; CECOM-80-0569-F) Avail: NTIS HC A07/MF A01 CSCL 20/14

This report presents the results of studies to develop the rationale for electromagnetic measurement techniques for use in the EMC evaluation of millimeter wave (MMW) communication-electronic equipment and systems. In the development of this rationale, seven basic tasks were performed. Under the first task, the EMC/EMI data requirements for MMW equipments and systems were established to provide a clear definition of the type of data needed. The second task was directed to the definition of appropriate measurement philosphy and techniques for obtaining the required data. Third task, the state-of-the-art in WEMC/EMI measurement instrumentation and components for the 10-300 GHz frequency band was reviewed to identify the instrumentation which is available to implement the measurement techniques defined in the previous tasks. Fourth task involved an evaluation of the advantages and disadvantages of manual, semi-automated, and

full automated, and fully automated measurement techniques to determine both the feasibility and cost-effectiveness of these three approaches to data collection and analysis. Fifth task, the likely errors associated with EMC/EMI measurements at MMW frequencies were identified. The sixth task involved selected experimental measurements to investigate the possible impact of surface wave phenomena on EMI coupling at MMW frequencies. Author (GRA)

N82-31592# Harris Corp., Melbourne, Fla. Government Communication Systems Div.
M-QAM MODEM VERIFICATION Final Technical Report
Robert C. Davis, Joseph C. Grabowski, Linz A. Lord, Jr., and Robert D. Stultz Griffiss AFB, N.Y. RADC Feb. 1982 121 p refs
(Contract F30602-80-C-0278; AF Proj. 2157)
(AD-A116142; RADC-TR-81-401) Avail: NTIS HC A06/MF A01 CSCL 17/2

The objective of this program was to verify the technical feasibility of the variable mode M-ary Quadrature Amplitude Modulation (M-QAM) concepts. Specifically, the adaptive predistortion and baseband equalizer techniques were to be breadboarded and evaluated for M-QAM modes for M = 4, 16, and 64. The breadboard was to operate within the constraints of FCC docket 19311 and achieve spectral efficiencies of 1.5, 3.0, and 4.5 bits/sec/Hz for M = 4, 16, and 64. The breadboard was constructed and tested and the adaptive predistortion and baseband equalizer techniques proven feasible. Performance curves are presented for the various modes (M = 4, 16, and 64) for back-to-back operation as well as through a simulated microwave link. Performance for various levels of TWT power backoff when predistortion is enabled or disabled and when the baseband equalizer is enabled or disabled are presented.
Author (GRA)

N82-31593# Harry Diamond Labs., Adelphi, Md.
DISPERSION CHARACTERISTICS OF A BEAM-DRIVEN CYLINDRICAL WAVEGUIDE WITH DIELECTRIC LINER
G. Daniel Dockery Apr. 1982 20 p refs
(DA Proj. 1L1-61101-A-91A)
(AD-A116507; HDL-TM-82-4) Avail: NTIS HC A02/MF A01 CSCL 20/7

The dispersion relation for a dielectric-lined, cylindrical waveguide filled with an electron beam is derived by using Maxwell's equations and the Lorentz force law. By using a no-beam approximation, the fundamental (TM01) mode is calculated with parameters resembling those expected in the Harry Diamond Laboratories Cerenkov device. Each of these parameters (waveguide size, dielectric thickness, and dielectric constant) is then varied to illustrate their effects on the dispersion curve. Higher TM0n modes (through TM06) are calculated to show how it is possible to couple to higher modes by using appropriate dielectric thicknesses. Author (GRA)

N82-31594# Michigan Univ., Ann Arbor. Radiation Lab.
SCATTERING BY RESISTIVE PLATES Final Technical Report, Oct. 1980 - Sep. 1981
M. Naor Griffiss AFB, N.Y. RADC Mar. 1982 122 p refs
(Contract F30602-78-C-0148; AF Proj. 4506)
(AD-A116116; RADC-TR-82-47) Avail: NTIS HC A06/MF A01 CSCL 20/14

The problem of electromagnetic scattering by resistive plates has been solved numerically using two coupled E-field integral equations and the method of moments. The Stratton-Chu representation for the electromagnetic field has been shown to be applicable to this type of problem and integral equations are derived from this representation. The numerical procedure developed guarantees the continuity of the potentials on the plate, a property which is shown to be essential for the convergence of the solution. The solution was tested by comparison with measured RCS data of resistive and perfectly conducting plates and the agreement for plates of about one square wavelength in area was within 1 to 2 dB for all angles of incidence. The low frequency behavior of a resistive plate has been compared to that of a perfectly conducting one based on the leading terms of the Rayleigh series. For a resistive plate the electric dipole moment is the same as for a perfectly conducting one but the magnetic dipole moment is zero. The transition to perfect conductivity is therefore discontinuous at low frequencies. The effect of the resistivity appears in the quadrupole term, and this can be expressed in terms of potentials similar to those required for the dipole contribution. The dipole moments for plates of several shapes have been computed by solving the integral equations for the static potentials.
Author (GRA)

N82-31595# Transportation Systems Center, Cambridge, Mass.
EVALUATION AND APPLICATION OF ENHANCEMENTS TO THE PERFORMANCE OF THE ASDE-3 RADAR IN HEAVY RAINS Final Report, Oct. 1980 - Sep. 1981
G. J. Bishop Mar. 1982 107 p refs
(AD-A116462; DOT-TSC-FAA-82-1; DOT/FAA/RD-81/94) Avail: NTIS HC A06/MF A01 CSCL 17/9

This report presents the results of a study performed by the Transportation Systems Center (TSC) to evaluate two proposed enhancements to the performance of the ASDE-3 Radar in heavy rain: Adaptive gain and adaptive clutter thresholding, (operating with frequency agility). The study was based on analysis of radar and rate of rainfall data collected by TSC during the ASDE-3 Engineering Tests and performance predicted by the ASDE-3 System Performance Model. Both enhancements were found to be subject to errors due to non-uniformity of rain. Adaptive gain was found to be fail-soft and of net benefit to ASDE-3 performance whereas adaptive clutter threshold which is subject to error from variations in both clutter and attenuation was found not to be of benefit. Information to aid in design and installation of an adaptive gain subsystem and alternative approaches for less demanding airports are also presented. Author (GRA)

N82-31596# Naval Research Lab., Washington, D. C. Target Characteristics Branch.
A COMPARISON OF NONCOHERENT AND COHERENT MTI'S Interim Report
F. F. Kretschmer, Jr., F. C. Lin, and B. L. Lewis 22 Jun. 1982 14 p refs
(SF1213691)
(AD-A116104; NRL-8591) Avail: NTIS HC A02/MF A01 CSCL 17/9

Analysis and Monte Carlo simulations reveal that a noncoherent MTI using an envelope detector differs from one using a square law detector. The square law detector is usually considered because of ease of analysis, and it is commonly stated or implied that the results are the same because of the similar spectral characteristics of the detectors. A comparison is made between the two noncoherent MTI's and the coherent MTI in terms of clutter attenuation and MTI improvement factors. GRA

N82-31597# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
REGULATION OF ELECTROMAGNETIC RADIATION: A CONFUSING COURSE THROUGH MODULATING E AND H WAVES M.S. Thesis
Laurent Romain Hourcle 15 Feb. 1982 141 p refs
(AD-A116743; AFIT/NR-82-14T) Avail: NTIS HC A07/MF A01 CSCL 20/14

The thesis examines radio-frequency radiation from the perspective of controlling it as a regulated pollutant. First it examines the character of radio-frequency radiation including a primer as to its unusual physical characteristics. It then examines the growth in use of non-ionizing radiation and the growing but still contradictory body of scientific data as to its potential adverse biological effects. With this as a foundation, the thesis then turns to a review of the world's primary radio-frequency radiation exposure standards and an examination of the several federal agencies which may be able to regulate radio-frequency radiation and their statutory basis for doing so. The thesis concludes in recommending a limited approach to regulation based upon radio-frequency radiations unique physical characteristics and the

limited consistent data as to adverse biological effects.
Author (GRA)

N82-31598# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INTERFERENCE SOURCES AND DEGREES OF FREEDOM IN ADAPTIVE NULLING ANTENNAS
Alan J. Fenn 12 May 1982 41 p refs
(Contract F19628-80-C-0002)
(AD-A116583; TR-604; ESD-TR-82-047) Avail: NTIS HC A03/MF A01 CSCL 09/5

It is sometimes desirable to know how many interference sources can N-element phased array or N-beam multiple-beam antenna can adaptively null. This problem is usually addressed by considering the antenna to have at most N-1 degrees of freedom available for placing null on interference sources. However, if some of the N-1 sources are very close together, it is possible that less than N-1 degrees of freedom are used. This paper quantitatively describes this effect by examining the eigenvalue spread of the interference covariance matrix. It is shown in the case of two equal-power interference sources in the field of view of either a multiple-beam antenna, or a phased array antenna, the two dominant eigenvalues are approximately equal when the source separation is equal to one half-power beamwidth. In other words, two degrees of freedom are consumed by two interference sources when they are separated by approximately one half-power beamwidth. This effect is also investigated for several configurations of three interference sources. To consume three degrees of freedom, it is shown that the eigenvalue spread is dependent on the interference source configuration and the antenna geometry. Author (GRA)

N82-31599# Little (Arthur D.), Inc., Paris (France).
FIBER OPTICS NETWORKS OR COMMUNICATION SATELLITES: ALTERNATIVES?
Malcolm H. Ross 1981 17 p Sponsored by ESA
Avail: NTIS HC A02/MF A01

Trends in communication technology are surveyed, and the roles of fiber optics and satellite based systems are predicted. Economic factors are seen as predominant in the choice of system. Fiber optics, in the short term, are becoming cost competitive with coaxial cables and microwave techniques over short distances and high channel densities. This trend is expected to continue, with fiber optics becoming a dominant. The relative maturity of space system technology makes large cost reductions through technological breakthroughs unlikely, so satellites remain economically viable only for very long distance links. The projected fiber optic transatlantic cable may be cost competitive with Intelsat satellites. The main advantage of satellite systems is their capacity to test services before they are implemented in terrestrial networks. Author (ESA)

N82-31600# Selenia S.p.A., Rome (Italy). Space Activities Div.
RADAR ALTIMETER PHASE A STUDY: SIGNAL PROCESSOR SIMULATION Final Report
Paris ESA 6 Jan. 1982 137 p
(Contract ESA-4428/80)
(TN-0126/81; ESA-CR(P)-1580) Avail: NTIS HC A09/MF A01

The locking transients and sensitivity of the signal processor height tracking, slope tracking, and automatic gain control loops were analyzed mathematically and simulated on an HP 9825 A computer. The system was evaluated with the loops interconnected and separate. The effects of fading and of environment transitions were considered. A procedure for passing from acquisition to tracking phase was defined. Results show that the system meets requirements as to slope accuracy, tracking performance, and observation time, if suggested improvements are incorporated in the design. Author (ESA)

N82-31601# Marconi Space and Defence Systems Ltd., Camberley (England). Research Centre.
ACTIVE MICROWAVE INSTRUMENT OPTIMISATION STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
Paris ESA Nov. 1981 37 p Sponsored in cooperation with EMI-Varian Ltd. and MBB, Munich
(Contract ESA-4666/80/F-DD(SC))
(MTR-82/13; ESA-CR(P)-1581) Avail: NTIS HC A03/MF A01

The overall active microwave instrument (AMI) system, the electronics, the RF switch matrix, the klystron, the SAR antenna, and configuration/thermal aspects were studied. It is shown that a common RF amplifying tube can be used for all three AMI functions (imaging SAR, wind scatterometer, wave scatterometer) if a common peak transmitted power of 10 kw is employed. Passive thermal control techniques can be used with standby heaters for thermal control of the high power amplifier. Author (ESA)

N82-31602# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
STUDY ON SYNOPSIS OF SATELLITE SCATTEROMETERS FOR CA BAND AND K BAND Final Report
W. Gilg, W. Gieraths, P. Hans, and H. Schuessler Paris ESA Dec. 1981 100 p refs
(Contract ESA-4772/81/F-DD(SC))
(ESA-CR(P)-1582) Avail: NTIS HC A05/MF A01

The performance of the ERS-1 wind scatterometer if antenna length is reduced from 4.8m to 3.6m, and differences in hardware design, performance, and cost when using a C band or a K band scatterometer were studied. The scatterometer section of the active microwave instrument (AMI) was designed for operation in the K band with antenna lengths up to 3.6m. A change to K band requires two additional K band high power amplifiers. An additional 125W may be needed to keep these amplifiers within temperature limits during eclipse. The only advantage of K band scatterometry is that a proven reference model for radar sea return already exists. Cost and sensitivity to atmospheric disturbances weigh against a C/K hybrid. Mass and power requirements favor a fully integrated C band AMI. Author (ESA)

N82-31603# Aeritalia S.p.A., Torino (Italy). Equipment Group.
INVESTIGATION FOR AN AUTOMATED ELECTROMAGNETIC FIELD GENERATING SYSTEM, VOLUME 1 Final Report
B. Audone, comp. and G. Gerbi, comp. Paris ESA 1982 148 p refs 2 Vol.
(Contract ESTEC-4509/80/NL-PP(SC))
(ESA-CR(P)-1584-Vol-1) Avail: NTIS HC A07/MF A01

The feasability of an automated electromagnetic field generating system (AEFGS) able to perform the radiated susceptibility, electromagnetic compatability test was studied. An AEFGS which covers the frequency range from 10 kHz to 40 GHz, generating a minimum electric field of 100V/m, 1m from the antennas was specified. Specifications can be met, except for maximum obtainable electric field intensity and for amplifier harmonic output. The 100V/m field in the frequency range from 10 kHz to 70 MHz can be obtained if a 10 kw amplifier replaces the suggested 2 kw one. A TWT amplifier is recommended for the 18 to 40 GHz range. Author (ESA)

N82-31604# Aeritalia S.p.A., Torino (Italy). Equipment Group.
INVESTIGATION FOR AN AUTOMATED ELECTROMAGNETIC FIELD GENERATING SYSTEM (AEFGS). VOLUME 2: INSTRUMENTATION DATA SHEETS COLLECTION, ANNEX Final Report
Paris ESA 1982 102 p Brochures supplement 2 Vol.
(Contract ESTEC-4509/80/NL-PP(SC))
(ESA-CR(P)-1584-Vol-2) Avail: NTIS HC A06/MF A01

Manufacturers' literature concerning equipment for an automated electromagnetic field generator system (to be used in radiated susceptibility tests) is presented. Information on synthesizers, amplifiers, oscillators, meters, attenuators, directional couplers, and coaxial/waveguide switches is given. Author (ESA)

N82-31605# Fondazione Ugo Bordoni, Rome (Italy).
OPTIMAL COEXISTENCE IN THE SAME FREQUENCY BAND OF TELEVISION AND MOBILE RADIO SERVICES [COESISTENZA OTTIMALE NELLA STESSA BANDA DI FREQUENZA DI SERVIZI RADIOMOBILI E TELEVISI]
Sergio Bonora (Fondazione G. Marconi), Gabriele Falciasecca

(Bologna Univ.), and Mario Frullone Dec. 1981 47 p refs In ITALIAN
(FUB-36-198) Avail: NTIS HC A03

Mutual interference between the 174 to 230 MHz television band transmission and mobile communication transmissions by the SST technique is reviewed. Theoretical aspects of SST electronic subsystem development are considered. An emphasis weighting function technique applied to a frequency hopping SST system is analyzed and compared to the operation of frequency hopping in regions of the television frequency band which are less sensitive to interference. The characteristics of measuring systems adapted to the research needs of SST development are discussed. Author (ESA)

N82-31606# Fondazione Ugo Bordoni, Rome (Italy).
A NEW ALGORITHM FOR THE AUTOMATIC SEGMENTATION OF THE VOICE SIGNAL IN SOUND AND SOUNDLESS TRACKS [UN NUOVO ALGORITMO PER LA SEGMENTAZIONE AUTOMATICA DEL SEGNALE VOCALE IN TRATTI SONORI E NON SONORI]
Simona Scotti and Domenico DeSeta Dec. 1981 31 p refs In ITALIAN
(FUB-39-1981) Avail: NTIS HC A03

A decision algorithm sound-no sound to be employed in voice signal analysis is presented. The parameters involved are the first coefficient of linear prediction, the energy of the voice signal segment and the energy of the prediction error. The experimental results show a three modes distribution indicating that the algorithm also discriminates the pauses from the no sound tracts. The time function of the sound track recognition probability is presented in two examples reffered to the same phrase uttered by six speakers, analyzed at 25.6 msec intervals. Author (ESA)

N82-31607# Fondazione Ugo Bordoni, Rome (Italy).
COST 201 STAND-BY NETWORK OPTIMIZATION MODULE (SBO). PART 2: EVALUATION OF PRIMAL AND DUAL PROCEDURES
Ugo Mocci and Giacomo Ravaioli Dec. 1981 28 p
(FUB-40-1981) Avail: NTIS HC A03

Primal and dual optimization procedures are described and compared. In both procedures capacities are increased step by step so as to reduce the total unfeasibility of the stand by network. In Primal, a minimum cost routing is found for each requirement and the edge capacities are accordingly adjusted where needed. In dual, all not yet feasible requirements are routed on the current network, suitable indexes to measure the effectiveness of new additions are computed and additional capacity is provided on the edges having the best figures of merit. Computer simulation tests show that both procedures are basically equivalent, although primal procedures, being faster, are more attractive for use in the Cost 201 project. Author (ESA)

N82-31608# Fondazione Ugo Bordoni, Rome (Italy).
A COMPUTING METHOD OF THE ERROR PROBABILITY IN 4PSK TRANSMITTING SYSTEMS UNDER SELECTIVE FADING CONDITION [METODO DI CALCOLO DELLA PROBABILITA DI ERRORE NEI SISTEMI DI TRASMISSIONE 4PSK AFFETTI DA FADING SELETTIVO]
Fabio Andreucci and Pier Giorgio Marchetti Dec. 1981 14 p refs In ITALIAN
(FUB-43-1981) Avail: NTIS HC A02/MF A01

A method for computing the error probability in 4PSK systems which is easier to implement and shorter to compute than the Gram-Charlier series expansion previously proposed, is described. The method is applicable when the interference amplitude after each pulse vanishes in a time interval shorter than 10 pulse to pulse periods. Models for the complex demodulated signal and for the transfer function of the multipath transmission are presented. A step by step calculation procedure is described and the implementation of the algorithm is discussed. An application example shows that the probability is computed with a 2% precision in one tenth of the time required for the Gram-Chartier series to start convergence. Author (ESA)

N82-31609# Fondazione Ugo Bordoni, Rome (Italy).
ANTENNA POLARIZATION CHARACTERISTICS AND THE METHOD FOR ITS DETERMINATION [CARATTERISTICHE DI POLARIZZAZIONE DELLE ANTENNE E METODOLOGIA PER IL LORO RILEVAMENTO]
Edoarado Carli (Trieste Univ., Italy) Dec. 1981 28 p refs In ITALIAN
(FUB-45-1981) Avail: NTIS HC A03/MF A01

Methods for measuring and representing the polarization characteristics of antennas with elliptic polarization are described. The characteristics of an elliptically polarized wave were determined measuring at least two field components and the phase difference between them. The polarization state is described by a tensor where the modulus and the phase determine the polarization characteristics. The tensor is represented by a complex plane where each point of the plane corresponds to one of the possible polarization states. Several measuring methods are reviewed including the measuring of linear components, the measuring of the circular components and the measuring of three amplitude rates. Interference and calibration problems related to those measurements are discussed. Author (ESA)

N82-31610# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF SYNCHRONIZERS WITH DELAY IN THE PRESENCE OF MULTIPLE PATH [ANALISI DEL SINCRONIZZATORE CON RITARDO IN PRESENZA DI CAMMINI MULTIPLI]
Fabio Andreucci and Pier Giorgio Marchetti Dec. 1981 42 p refs In ITALIAN
(FUB-47-1981) Avail: NTIS HC A03/MF A01

A synchronizer composed of a delay line, summing, selective filter, forming network and zero crossing was studied. The feed signal was of a 4PSK type at a relatively low frequency. The two binary sequences were obtained by pseudorandom generators. Thermal noise was simulated by FORTRAN subroutine. It is shown that for signal to noise (SNR) larger than 10dB the average zero crossing is practically independent of the SNR, but the standard deviation increases considerably at the lower values of the SNR. The presence of the synchronizer improves the receiver performance substantially. Author (ESA)

N82-31611# Fondazione Ugo Bordoni, Rome (Italy).
REPORT ON THE COLLABORATION ACTIVITIES BETWEEN FONDAZIONE UGO BORDONI AND THE INSTITUTO SUPERIORE POSTE E TELECOMUNICAZIONI Annual Report, 1981 [RELAZIONE SULL'ATTIVITA DI COLLABORAZIONE CON L'ISTITUTO SUPERIORE POSTE E TELECOMUNICAZIONI SVOLTA DALLA FONDAZIONE UGO BORDONI NEL 1981]
Renato Koch Feb. 1982 46 p refs In ITALIAN
Avail: NTIS HC A03/MF A01

Research concerning radio communication systems, cable communication systems and digital systems, automatic communication, management and control systems, and laser and optoelectronic systems is summarized. Author (ESA)

N82-31612# Fondazione Ugo Bordoni, Rome (Italy).
PAIRS OF ARC-DISJOINT PATHS IN A NETWORK
Piero Filipponi and Francesco Mazzarella Jan. 1982 20 p refs
(FUB-1-1982) Avail: NTIS HC A02/MF A01

Two methods for finding suboptimal arc-disjoint paths between two given nodes of a network are discussed and compared to an existing optimal (minimum cost) method. Computation time for both methods are shorter than the optimal method and a computer experiment shows that for one of the methods the probability of cost coincidence with the optimal method is close to one for a sufficiently large number of the network nodes. The problems of finding the optimal pair of arc-disjoint paths with a unique source (or destination) is also discussed. Author (ESA)

N82-31613# Fondazione Ugo Bordoni, Rome (Italy).
MEASURING METHODS OF THE INTELLIGIBILITY AND THE INTELLIGIBILITY LIMIT OF VOICE SIGNALS [METODI DI MISURA DELLA INTELLIGIBILITA E DELLA SOGLIA DI INTELLEGIBILITA DEL SEGNALE VOCALE]

Simona Scotti Jan. 1982 24 p refs In ITALIAN
(FUB-5-1982) Avail: NTIS HC A02/MF A01

The definitions of the voice signal intelligibility and the intelligibility limit are discussed, and the methods to measure intelligibility are examined. While intelligibility is defined as a percentage, the corresponding limit is defined as the perturbation condition for which intelligibility is reduced to 50%, expressed as signal level or signal to noise ratios. The measuring method varies with the type of phoneme used (meaningless phrases, rhymed works, or normal speech). Intelligibility curves for the three methods are given. Author (ESA)

N82-31614# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
CONCATENATED CODING ON A SPACECRAFT-TO-GROUND TELEMETRY CHANNEL: METHOD
M. R. Best and H. F. A. Roefs 6 Aug. 1981 12 p refs Presented at Intern. Colloq. on Inform. Theory, Budapest, 24-28 Aug. 1981
(NLR-MP-81048-U) Avail: NTIS HC A02/MF A01

Techniques for encoding and decoding in a concatenated coding scheme consisting of a convolutional inner code and a Reed-Solomon outer code were evaluated. The Reed-Solomon code has length 256, dimension 224, and is defined over an alphabet of 257 elements. Fermat number transform, long division, Berlekamp's algorithm, Euclidean algorithm, continued fraction expansion, and Chien search are discussed. A combination of techniques that meets the operational constraints, and that is best suited for the code under consideration in terms of logical and computational complexity is presented. Author (ESA)

N82-31615# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
THE HANKEL PROBABILITY DISTRIBUTION. THE DISTRIBUTION FOR THE PRODUCT OF TWO EXPONENTIALLY DISTRIBUTED RANDOM VARIABLES
R. M. Jones Aug. 1981 14 p refs
(PB82-160995; NOAA-TM-ERL-WPL-79; NOAA-81120310) Avail: NTIS HC A02/MF A01 CSCL 20N

For the purpose of calculating the probability distribution of a skywave sea echo, the process is modeled as the product of two independent exponentially-distributed random variables. Because the resulting probability distribution involves the Hankel function, it is tentatively named the Hankel probability distribution. The Hankel distribution is compared with the measured distribution for skywave backscatter from the sea and reasonable agreement was achieved. It is believed that an exponential distribution is a reasonable approximation to the distribution function for ionospheric reflection. This same analysis applies to skywave backscatter from the ground. GRA

N82-31616# National Bureau of Standards, Washington, D.C. National Engineering Lab.
METHODS OF SUPPRESSING AUTOMOTIVE INTERFERENCE
Harold E. Taggart Nov. 1981 20 p refs Sponsored in part by the National Inst. of Justice
(PB82-165259; NBS-SP-480-44; LC-81-600165) Avail: NTIS HC A02/MF A01 CSCL 17B

Automotive manufacturers utilize several techniques to reduce EMI emanating from the vehicle. The techniques include resistor spark plugs, resistor spark plug cables, use of silicone lubricant in the distributor, use of capacitors as filters, placement of grounding straps at key locations, conductive fan belt discharge, and tire static-charge reduction. If even further reduction is needed to obtain the maximum capability of a specific mobile communication system, additional suppression techniques are discussed which are effective at frequencies from approximately 30 to 1000 MHz. Measurement results show that the EMI from a new production-line automobile, measured in accordance with SAE Standard J551g, can be reduced as much as 10 to 15 dB by employing these suppression techniques. The amount of degradation to a mobile narrow-band FM receiver, such as the type used by law enforcement agencies, can be measured using the measurement technique described. This same technique can then be used as a tool to further reduce EMI from the vehicle components. GRA

N82-31617# Institute for Telecommunication Sciences, Boulder, Colo. Inst. for Telecommunication Sciences.
A METHOD FOR DETERMINING THE MINIMUM ELLIPTICAL BEAM OF A SATELLITE ANTENNA
Hiroshi Akima Oct. 1981 36 p refs
(PB82-153966; NTIA/REPT-81-88) Avail: NTIS HC A03/MF A01 CSCL 09E

The minimum elliptical beam of a satellite antenna is studied. A method based on a search for a minimum elliptical beam over all possible ranges of all necessary parameters that specify the elliptical beam was developed. The method and the computer program that implements the method are described. It also gives some examples. GRA

N82-31898# Joint Publications Research Service, Arlington, Va.
STUDY OF OPERATOR'S INFORMATION IN THE COURSE OF COMPLICATED AND COMBINED ACTIVITY
N. V. Krylova and A. K. Bokovikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 33-36 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 25-27 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31899# Joint Publications Research Service, Arlington, Va.
USE OF VOICE COMMUNICATION TO STUDY OPERATOR ACTIVITY
A. P. Bebutov, V. V. Danilovtsev, and N. V. Krylova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 37-41 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 27-29 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-32288# Joint Publications Research Service, Arlington, Va.
SPACE ANTENNAS
V. Andreyev and V. Shagov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 71-74 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 40-41 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-31618# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPECTRAL ANALYSIS OF PSK SIGNALS AND THE DEVELOPMENT OF MICROWAVE MODULATORS M.S. Thesis [ANALISE ESPECTRAL DE SINAIS PSK E PROJETO DE MODULADORES EM MICROONDAS]
Eduardo Antonio Parada Tude Mar. 1982 69 p refs In PORTUGUESE Original contains color illustrations
(INPE-2339-TDL/082) Avail: NTIS HC A04/MF A01

The PSK signal produced by carrier modulation in microwave frequency is analyzed for the PSK spectrum with several kinds of digital signals, and the construction of a phase modulator in microwaves using PIN diode phase shifters is studied. A prototype in 1,2 GHz was built to investigate the PSK signal and the use of pre and pos modulation filters to reduce the band. S.L.

N82-31619# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THREE SECTION 240 MHz HELICAL FM FILTER [FILTRO HELICOIDAL DE TRES SECOES FM 240 MHZ]
Satoshi Koshima Feb. 1982 52 p ref In PORTUGUESE
(INPE-2313-NTE/179) Avail: NTIS HC A04/MF A01

The design of a three section helical filter operating in 240 MHz is presented. Experimental results confirmed the exceptional quality of this type of filter, characterized by low loss. Without extreme care, a filter was obtained with insertion loss under 0.6 dB, good flatness in the passband, and a stopband attenuation greater than 50 dB. With the gilding of the helical spiral and covering of the filter body with alodine it was possible to achieve a filter with insertion loss less than 0.3 dB. S.L.

N82-31620# Sperry Research Center, Sudbury, Mass.
MULTIPOLE MONOLITHIC SURFACE ACOUSTIC WAVE (SAW) RESONATOR FILTERS Interim Technical Report
Apr. 1982 98 p refs
(Contract N00014-81-C-2066)
(AD-A115468; SRC-CR-82-19) Avail: NTIS HC A05/MF A01 CSCL 09/5

We have successfully produced four and six pole SAW resonator filters for the first time, to our knowledge. The foundation for future development work has been established through the successful application of a synthesis technique, development of rapid analysis routines, and the application of our single pole resonator design and fabrication techniques to multipole configurations utilizing transducer and reflector coupling. Significant and critical innovations during this program include the techniques, through analysis, of determining the correct isolated pole resonance frequency to effect a synchronously tuned filter, establishment of physical methods for determining and setting these frequencies, and the establishment of a technique for adjusting the coupling of a reflector coupler. The response characteristics attained thus far meet only some of the performance criteria; notably: insertion loss, shape factor, bandwidths, and center frequencies. Problems remain in shaping the passband, improving the rejection level, and reducing leakage. We have outlined the work to be performed in phase 2 which is oriented towards solving these problems. GRA

N82-31621# Naval Research Lab., Washington, D. C.
NUMERICAL STUDY OF ELECTRON LEAKAGE POWER LOSS IN A TRI-PLATE TRANSMISSION LINE Interim Report
R. J. Barker and Shyke A. Goldstein 23 Jun. 1982 35 p refs
(AD-A116327; NRL-MR-4837) Avail: NTIS HC A03/MF A01 CSCL 10/2

Numerical simulations have been conducted using NRL's DIODE2D computer code to model the steady-state behavior of electron flow in a radial diode and in its adjacent tri-plate transmission line (TTL). Particular attention was paid to the magnitude of the electron current flowing from the cathode to the anode surface in the TTL. A quantitative value for this effective power loss is given. The electron current is restricted mainly to the transition region in the TTL into which there is 'seepage' of the B(z) that is imposed in the diode gap. This finding highlights the importance of that region to diode designers. Author (GRA)

N82-31622# Martin Marietta Aerospace, Orlando, Fla.
QUALITY ASSURANCE PROCEDURES FOR LSI Final Technical Report, Jan. 1979 - Feb. 1981
Lee A. Mirth Mar. 1982 90 p refs
(Contract F30602-79-C-0071; AF Proj. 2338)
(AD-A116252; RADC-TR-82-43) Avail: NTIS HC A05/MF A01 CSCL 09/5

Procurement of large hermetically sealed microcircuits in small quantities was found to require a specialized quality assurance test procedure which emphasizes process control. Samples of several complex circuits were fabricated and tested under a variety of controls to determine which environmental test methods were in need of modification. Recommendations are included.
Author (GRA)

N82-31623# Science Research Council, Chilton (England).
TRANSIENT STABILITY OF HIGH CURRENT DENSITY SUPERCONDUCTING WIRES
D. E. Baynham, V. W. Edwards, and M. N. Wilson 1980 4 p refs Presented at the Appl. Superconductivity Conf., Santa Fe, N. Mex., 29 Sep. 1980
(RL-80-066; CONF-800980-47) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The transient stability of cooled superconductors is described. A theoretical model and the criteria for achieving an order of magnitude improvement in transient stability are delineated. Transient stability measurements on single wire NbTi and Nb3Sn samples subjected to 100 microsec heat pulses are reported. The order of magnitude improvement in stability predicted by the theoretical model, is shown by samples cooled with a porous metal surface heat exchanger. GRA

N82-31624# California Univ., Livermore. Lawrence Livermore Lab.
RELATIVE RADIATION SENSITIVITY OF INSULATORS, STABILIZERS, AND SUPERCONDUCTORS
R. A. VanKonynenburg and M. W. Guinan 15 Jan. 1982 19 p refs
(Contract W-7405-eng-48)
(DE82-007986; UCID-19292) Avail: NTIS HC A02/MF A01

The radiation sensitivity of the various parts of superconducting magnet systems was compared. Using the radiation spectra calculated by Engholm for the engineering test facility (ETF) toroidal field magnet inboard leg and available data on radiation effects, commonly used magnet components were ranked in order of radiation sensitivity. It was found that epoxy based insulators and copper and aluminum stabilizers were the most sensitive parts of the magnets, more sensitive than the superconductors. Use of polyimide based insulators would make the insulators less vulnerable than the stabilizers and superconductors. DOE

N82-31625# Los Alamos Scientific Lab., N. Mex.
OPERATING LIMITS ON COMMUTATOR dc MACHINES USED AS ELECTROMECHANICAL CAPACITORS
Philip Thullen 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002403; LA-UR-81-2942; CONF-811040-74) Avail: NTIS HC A02/MF A01

Rebuilt motors were tested and the impact of possible variation of characteristics among the machines were tested, the operation of the facility are discussed. Commutation limits and their relationship to the economics and reliability of the system are also discussed. When installed, the system will consist of 30 motors and will have a rating of 50 kA, 1.68 kV corresponding to 84 MVA at a peak power of 42 MW. DOE

N82-31626# Argonne National Lab., Ill. Fusion Power Program.
DEVELOPMENT, ANALYSIS AND CONTROL OF THE INDUCTOR-CONVERTER BRIDGE Ph.D. Thesis
M. Ehsani and Robert L. Kustom Aug. 1981 361 p refs
(Contract W-31-109-eng-38)
(DE82-001611; ANL/FPP/TM-144) Avail: NTIS HC A16/MF A01

The inductor-converter bridge (ICB) is a solid state dc-ac-dc power converter system for bidirectional, controllable, energy transfer between two high Q magnet coils. The ICB is suitable for supplying large pulsed power to such magnets as the superconducting equilibrium field (EF) coil of the proposed Tokamak power reactors, from another superconduction energy storage coil. This report presents work on the analysis and control the ICB system. The process of energy transfer between the coils is explained on the basis of a simple one line equivalent circuit. This circuit is the topological dual of the one line diagram of the nonsalient pole synchronous generator, connected to the infinite bus through its synchronous reactance. The changes in the average power, average coil currents, and voltages, as functions of time, are calculated by the conventional Fourier method of analysis. DOE

N82-31627# California Univ., Berkeley. Lawrence Berkeley Lab.
EVIDENCE FOR BIFURCATION AND UNIVERSAL CHAOTIC BEHAVIOR IN NONLINEAR SEMICONDUCTING DEVICES
J. Testa, J. Perez, and C. Jeffries Jan. 1982 34 p refs
(Contract W-7405-eng-48)
(DE82-011106; LBL-13719) Avail: NTIS HC A03/MF A01

Bifurcations, chaos, and extensive periodic windows in the chaotic regime are observed for a driven LRC circuit, the capacitive element being a nonlinear varactor diode. Measurements include power spectral analysis; real time amplitude data; phase portraits; and a bifurcation diagram, obtained by sampling methods. The effects of added external noise are studied. These data yield experimental determinations of several of the universal numbers predicted to characterize nonlinear systems having this route to chaos. DOE

N82-31628# Sandia Labs., Albuquerque, N. Mex.
LOW-TEMPERATURE VOID FORMATION IN GOLD-ALUMINUM CONTACTS
P. V. Plunkett and J. F. Dalporto 1982 7 p refs Presented at the 32nd Electron. Components Conf., San Diego, Calif., 10 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-011569; SAND-81-2642C; CONF-820521-2) Avail: NTIS HC A02/MF A01

Recent work has been presented which indicates voids forming in either aluminum to gold wirebonds or gold to aluminum wirebonds at temperatures below 2000 C are studied. The rate and extent of void formation at low temperatures (1250 C and 1500 C) and high temperatures (2250 C and 3000 C) using aluminum to gold and gold to aluminum wirebonds are compared. DOE

N82-31629# Data Power, Inc., Santa Ana, Calif.
HIGH-INTENSITY-DISCHARGER 400-W SODIUM BALLAST, PHASE 2 Final Report
Gerald Felper Oct. 1981 39 p refs
(Contract W-7405-eng-48)
(DE82-011103; LBL-13889; EEB-L-82-01) Avail: NTIS HC A03/MF A01

An energy efficient high intensity discharge solid state 400 watt ballast lighting system was developed. Test data comparisons were made. Methods to increase ballast efficiency, and the importance of power factors were determined. Bulb life tests were conducted, specification review, and performance versus cost analysis were performed, the ballast was investigated to determine compliance with FCC requirement, and a line transient specification in respect to solid state ballasting was determined. In addition, reliability testing, a manufacturing test plan, a marketing study for solid state ballast, and the manufacture and delivery of fifteen demonstration ballast units were required. These requirements are discussed. DOE

N82-31630# Fondazione Ugo Bordoni, Rome (Italy).
MULTIPORT MODULE-2 GENERATORS OF PSEUDORANDOM BINARY SEQUENCES
Odoardo Brugia, Maurizio Pioli (Ind. Face Standard S.p.A.), and William Wolfowicz Mar. 1982 6 p refs
(FUB-3-1982) Avail: NTIS HC A02/MF A01

A pseudorandom binary sequences generator which works at suitable reduced rates is described. The proposed device reduces problems presented at high bit rates by the two port feedback shift registers combined in a module two adder. When the needed reduction rate is an integral power of two, the problem can be solved by using a module two sequential network with L outlet ports. This generates sets of L binary symbols at the rate f/L, multiplexed impulse response is equal to that of the two port feedback shift register working at the rate f. A procedure of synthesis of these multiport generators is detailed. Author (ESA)

N82-31631# Fondazione Ugo Bordoni, Rome (Italy).
AVERAGE POWER DENSITY SPECTRUM AT THE OUTPUT OF TWO-PORT STRICTLY-RECURSIVE MODULO-2 SEQUENTIAL NETWORKS
Odoardo Brugia, Gianni Campanini, Salvatore Improta (FATME S.P.A.), and William Wolfowicz Feb. 1982 6 p refs
(FUB-4-1982) Avail: NTIS HC A02/MF A01

Autocorrelation and average power density spectrum at the output of two port strictly recursive module two sequential networks are expressed as a function of the impulse response period, of the number of ones included in a single period, and of the input statistics. A model of the network consisting of M delayers, M binary scalers and a module two adder and the input output equations is described. The average power density spectrum at the output of class four partial response coders, and the average power density spectrum of a scrambler AMI coder cascade are examined. Author (ESA)

N82-31632# Sheffield Univ. (England). Dept. of Control Engineering.
NON-LINEAR CIRCUIT MODE ANALYSIS
D. A. Linkens Mar. 1982 67 p refs
(RR-177) Avail: NTIS HC A04/MF A01

The theoretical analysis of circuits comprising sets of intercoupled nonlinear oscillators was reviewed. Mathematical modeling of biomedical systems, particularly for the electrical activity of the gastrointestinal digestive tract, is discussed. A matrix linearization method was developed, and applied to a wide range of structures comprising chains, arrays, rings and tubes. Different coupling components, including pure time delay, and two types of van der Pol oscillator dynamics were investigated. Numerous mode patterns were predicted and experimentally observed, and stability criteria were established for a wide range of conditions. The multioscillator mode analysis entails matrix mode decoupling followed by equivalent linearization similar to the Krylov-Bogolioubov approach. Author (ESA)

N82-31633# Science Research Council, Chilton (England). Physics Apparatus Group.
AN ACTIVE TERMINATING PRE-AMPLIFIER FOR DELAY LINE READOUT SYSTEMS
R. Stephenson and C. S. Gao 1981 18 p refs
(PB82-156837; RL-81-071) Copyright. Avail: NTIS HC A02/MF A01 CSCL 09E

A preamplifier specifically designed for use with artificial delay lines in positional readout systems. The preamplifier provides an active delay line termination which gives reduced noise compared with simple resistive termination whilst maintaining the signal rise time to allow optimum timing discriminator performance. Test results show a significant improvement in resolution compared with resistive terminated systems. GRA

N82-31634# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EFFECTS OF AIR MASS AND INTEGRATION METHODS ON RESULTS FOR OPTICAL PROPERTY MEASUREMENTS OF SOLAR COVER PLATE AND ABSORBER MATERIALS
Willard E. Roberts, Larry W. Masters, and Elizabeth J. Clark Jan. 1982 48 p refs Sponsored in part by NBS and DOE
(PB82-165184; NBSIR-81-2448) Avail: NTIS HC A03/MF A01 CSCL 09E

Methods of calculating the transmittance of cover plate materials and the reflectance of absorber materials are compared. Optical data were obtained for both aged and unaged test specimens using an integrating sphere spectrophotometer. The data were integrated using both the weighted and selected ordinate methods in ASTM E 424, Method A, at air mass 2.0, and the selected ordinate method at air mass 1.5 and 1.0. The solar reflectance and solar transmittance values calculated using the various methods are presented and the impact of the data in terms of possible revisions to ASTM E 424 is discussed. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N82-31635 Ecole Polytechnique Federale de Lausanne (Switzerland). Lab. d'Hydraulique.

[ACTIVITIES OF THE HYDRAULICS LABORATORY] Annual Report, 1981 [RAPPORT ANNUEL, 1981 DU LABORATOIRE D'HYDRAULIQUE.]

1981 79 p refs In FRENCH

Avail: Issuing Activity

The hydraulics of straight canals with mobile beds, sedimentation of dams, internal hydrodynamics of Lake Geneva, and air water interactions on Lake Geneva are studied. Details of courses taught and contracts worked on are given. Author (ESA)

N82-31636# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.

LAMINAR FLOW OVER A SMALL UNSTEADY THREE DIMENSIONAL HUMP

P. W. Duck May 1981 21 p refs

(Contract N00014-76-C-0333)

(TR-4) Avail: NTIS HC A02/MF A01

The effect of a small three dimensional hump (whose shape varies some way in time) on an incompressible boundary layer is studied, using extensions to triple deck theory, for a number of regimes of unsteadiness. The effects on both two dimensional and three dimensional boundary layers are considered. These results are used to consider the interaction between a boundary layer and a small vibrating panel, situated on an otherwise flat surface. Author

N82-31637*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

REAL TIME ESTIMATION AND PREDICTION OF SHIP MOTIONS USING KALMAN FILTERING TECHNIQUES

Michael A. Triantafyllou, Marc Bodson, and Michael Athans Jul. 1982 142 p refs

(Grant NGL-22-009-124)

(NASA-CR-169284; NAS 1.26:169284; LIDS-R-1220) Avail: NTIS HC A07/MF A01 CSCL 20D

A landing scheme for landing V/STOL aircraft on rolling ships was sought using computerized simulations. The equations of motion as derived from hydrodynamics, their form and the physical mechanisms involved and the general form of the approximation are discussed. The modeling of the sea is discussed. The derivation of the state-space equations for the DD-963 destroyer is described. Kalman filter studies are presented and the influence of the various parameters is assessed. The effect of various modeling parameters on the rms error is assessed and simplifying conclusions are drawn. An upper bound for prediction time of about five seconds is established, with the exception of roll, which can be predicted up to ten seconds ahead. R.J.F.

N82-31638*# Connecticut Univ., Storrs. Dept. of Mechanical Engineering.

TURBINE ENDWALL SINGLE CYLINDER PROGRAM Semiannual Status Report, 1 Jan. - 1 Jul. 1982

Lee S. Langston 1 Jul. 1982 50 p refs

(Grant NsG-3238)

(NASA-CR-169278; NAS 1.26:169278) Avail: NTIS HC A03/MF A01 CSCL 20D

Detailed measurement of the flow field in front of a large-scale single cylinder, mounted in a wind tunnel is discussed. A better understanding of the three dimensional separation occuring in front of the cylinder on the endwall, and of the vortex system that is formed is sought. A data base with which to check analytical and numerical computer models of three dimensional flows is also anticipated. Author

N82-31639*# City Coll. Research Foundation, New York. Turbomachinery Lab.

EXPERIMENTAL STUDY OF TURBULENCE IN BLADE END WALL CORNER REGION

R. Raj Aug. 1982 110 p refs

(Grant NAG3-122)

(NASA-CR-169283; NAS 1.26:169283; RF-05438) Avail: NTIS HC A06/MF A01 CSCL 20D

Corner flows and wall pressure fluctuations, design and fabrication of the test model, preliminary results on boundary layer, flow visualization, turbulence intensity and spectra measurements are presented. The design consideration and fabrication report on the newly built wind tunnel to be used for subsequent continuation of the research effort is also presented. S.L.

N82-31640*# Old Dominion Univ., Norfolk, Va. Dept. of Oceanography.

THE RECEPTIVITY OF BOUNDARY LAYERS ON BLUNT BODIES TO OSCILLATIONS IN THE FREE STREAM Final Report

C. E. Grosch Aug. 1982 188 p refs

(Grant NAG1-96)

(NASA-CR-169271; NAS 1.26:169271) Avail: NTIS HC A09/MF A01 CSCL 20D

One aspect of the boundary layer receptivity problem is examined, that of the flow induced in the bounday layer on the forward portion of a blunt body by unsteadiness in the mean flow. An approximate solution for the disturbances generated in the boundary layer by a long wavelength sound wave impinging normally on the front of a body in steady motion is also provided. Author

N82-31641*# Cornell Univ., Ithaca, N. Y. Energy Program.

EXHAUST GAS MEASUREMENTS IN A PROPANE FUELED SWIRL STABILIZED COMBUSTOR

M. S. Aanad Aug. 1982 177 p refs

(Grant NsG-3019)

(NASA-CR-169293; NAS 1.26:169293; E-82-4) Avail: NTIS HC A09/MF A01 CSCL 20D

Exhaust gas temperature, velocity, and composition are measured and combustor efficiencies are calculated in a lean premixed swirl stabilized laboratory combustor. The radial profiles of the data between the co- and the counter swirl cases show significant differences. Co-swirl cases show evidence of poor turbulent mixing across the combustor in comparison to the counter-swirl cases. NO sub x levels are low in the combustor but substantial amounts of CO are present. Combustion efficiencies are low and surprisingly constant with varying outer swirl in contradiction to previous results under a slightly different inner swirl condition. This difference in the efficiency trends is expected to be a result of the high sensitivity of the combustor to changes in the inner swirl. Combustor operation is found to be the same for propane and methane fuels. A mechanism is proposed to explain the combustor operation and a few important characteristics determining combustor efficiency are identified. J.D.

N82-31642*# Cornell Univ., Ithaca, N. Y.

FLOW PROCESS IN COMBUSTORS

F. C. Gouldin Jun. 1982 16 p refs

(Grant NsG-3019)

(NASA-CR-169294; NAS 1.26:169294) Avail: NTIS HC A02/MF A01 CSCL 20D

Fluid mechanical effects on combustion processes in steady flow combustors, especially gas turbine combustors were investigated. Flow features of most interest were vorticity, especially swirl, and turbulence. Theoretical analyses, numerical calculations, and experiments were performed. The theoretical and numerical work focused on noncombusting flows, while the experimental work consisted of both reacting and nonreacting flow studies. An experimental data set, e.g., velocity, temperature and composition,

was developed for a swirl flow combustor for use by combustion modelers for development and validation work. J.D.

N82-31643*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
INVESTIGATIONS OF FLOWFIELDS FOUND IN TYPICAL COMBUSTOR GEOMETRIES Semiannual Status Report, 1 Feb. - 31 Jul. 1982
David G. Lilley 31 Jul. 1982 252 p refs
(Grant NAG3-74)
(NASA-CR-169295; NAS 1.26:169295; SASR-4) Avail: NTIS HC A12/MF A01 CSCL 20D

Experimental and theoretical research undertaken on 2-D axisymmetric geometries under low speed, nonreacting, turbulent, swirling flow conditions is reported. The flow enters the test section and proceeds into a larger chamber (the expansion ratio D/d = 2) via a sudden or gradual expansion (sidewall angle alpha = 90 and 45 degrees). Inlet swirl vanes are adjustable to a variety of vane angles with values of phi = 0, 38, 45, 60 and 70 degrees being emphasized. Author

N82-31644*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NEW NUMERICAL METHOD FOR THE SIMULATION OF THREE DIMENSIONAL FLOW IN A PIPE
A. Leonard and A. Wray Jul. 1982 11 p refs
(NASA-TM-84267; A-8980; NAS 1.15:84267) Avail: NTIS HC A02/MF A01 CSCL 20D

A new numerical technique for simulating three dimensional, unsteady, incompressible pipe flows is presented and its utility and accuracy is shown. Each vector function in the expansion of the velocity field is divergence free and satisfies the boundary conditions for viscous flow. Some of the benefits of the expansion technique are that pressure is eliminated from the dynamics, only two unknowns per mesh point are required, implicit treatment of the viscous terms is provided at no extra computational cost, and no fractional time steps are required. The method uses spectral expansions: Fourier series in the azimuthal and streamwise directions, and Jacobi polynominals in the radial direction. R.J.F.

N82-31645*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LAMINAR FLOW CONTROL, 1976 - 1982: A SELECTED ANNOTATED BIBLIOGRAPHY
Marie H. Tuttle and Dal V. Maddalon Aug. 1982 82 p
(NASA-TM-84496; L-15434; NAS 1.15:84496) Avail: NTIS HC A05/MF A01 CSCL 20D

Laminar Flow Control technology development has undergone tremendous progress in recent years as focused research efforts in materials, aerodynamics, systems, and structures have begun to pay off. A virtual explosion in the number of research papers published on this subject has occurred since interest was first stimulated by the 1976 introduction of NASA's Aircraft Energy Efficiency Laminar Flow Control Program. The purpose of this selected bibliography is to list available, unclassified laminar flow (both controlled and natural) research completed from about 1975 to mid 1982. Some earlier pertinent reports are included but listed separately in the Appendix. Reports listed herein emphasize aerodynamics and systems studies, but some structures work is also summarized. Aerodynamic work is mainly limited to the subsonic and transonic sped regimes. Because wind-tunnel flow qualities, such as free stream disturbance level, play such an important role in boundary-layer transition, much recent research has been done in this area and it is also included. Author

N82-31646*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STUDIES OF IMPLICIT AND EXPLICIT SOLUTION TECHNIQUES IN TRANSIENT THERMAL ANALYSIS OF STRUCTURES
Howard M. Adelman, Raphael T. Haftka, and James C. Robinson Aug. 1982 47 p refs
(NASA-TP-2038; L-15245; NAS 1.60:2038) Avail: NTIS HC A03/MF A01 CSCL 20D

Studies aimed at an increase in the efficiency of calculating transient temperature fields in complex aerospace vehicle structures are reported. The advantages and disadvantages of explicit and implicit algorithms are discussed and a promising set of implicit algorithms with variable time steps, known as GEARIB, is described. Test problems, used for evaluating and comparing various algorithms, are discussed and finite element models of the configurations are described. These problems include a coarse model of the Space Shuttle wing, an insulated frame test article, a metallic panel for a thermal protection system, and detailed models of sections of the Space Shuttle wing. Results generally indicate a preference for implicit over explicit algorithms for transient structural heat transfer problems when the governing equations are stiff (typical of many practical problems such as insulated metal structures). The effects on algorithm performance of different models of an insulated cylinder are demonstrated. The stiffness of the problem is highly sensitive to modeling details and careful modeling can reduce the stiffness of the equations to the extent that explicit methods may become the best choice. Preliminary applications of a mixed implicit-explicit algorithm and operator splitting techniques for speeding up the solution of the algebraic equations are also described. Author

N82-31647# Wisconsin Univ., Madison. Mathematics Research Center.
MATHEMATICAL AND NUMERICAL ANALYSIS OF A TURBULENT VISCOSITY MODEL
C. M. Brauner and C. Laine Apr. 1982 26 p refs
(Contract DAAG29-80-C-0041)
(AD-A116176; MRC-TSR-2366) Avail: NTIS HC A03/MF A01 CSCL 12/1

The turbulent viscosity assumption is the simplest turbulent closure of the Navier-Stokes equations. Of the possible models, some are of physical interest. In the case of the plane duct, a model based on the length scale, Uf, of the flow seems appropriate. Moreover, the introduction of such a model in the Navier-Stokes equations leads to a novel nonlinear parabolic equation, whose mathematical study is the subject of this paper. Author (GRA)

N82-31648# Wisconsin Univ., Madison. Mathematics Research Center.
THE INFLUENCE OF SURFACE TENSION ON CAVITATING FLOW PAST A CURVED OBSTACLE
Jean-Marc Vanden Broeck Mar. 1982 21 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A116321; MRC-TSR-2356) Avail: NTIS HC A02/MF A01 CSCL 20/4

The classical solution for cavitating flow past a curved obstacle leaves the position of the separation points undetermined. It is shown that this degeneracy is removed by introducing surface tension. A unique solution is obtained by requiring the flow to leave the obstacle tangentially. As the surface tension tends to zero this solution tends to the classical solution satisfying the Brillouin-Villat condition. A perturbation solution for small values of the surface tension is derived. Graphs of the results for the cavitating flow past a circular cylinder are presented.
Author (GRA)

N82-31649# Army Military Personnel Center, Alexandria, Va.
FORCES CAUSED BY NON-BREAKING WAVES STRIKING A SMOOTH, VERTICAL WALL AT SMALL ANGLES OF INCIDENCE M.S. Thesis. Final Report
Stephen A. Hanson 23 Jun. 1982 78 p refs
(AD-A116384) Avail: NTIS HC A05/MF A01 CSCL 20/4

Weggel's (1981) method for calculating water wave forces on smooth, vertical walls is experimentally verified for an intermediate-length, non-breaking wave which approaches the structure at several small angles of incidence. Mach-stem reflection data is verified with respect to results from Perroud (1957) and Nielsen (1962). Cnoidal wave theory is applied to measured wave data to create pressure distributions, which are verified by measured pressure values. The cnoidal pressure distributions are graphically

integrated to produce force values which are compared to values generated by Weggel's method. GRA

N82-31650# Wisconsin Univ., Madison. Mathematics Research Center.
WATER WAVES IN A CHANNEL OF VARIABLE CROSS SECTION
Xi-Chang Zhong (Chinese Academy of Sciences, Beijing) and M. C. Shen Mar. 1982 32 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A116214; MRC-TSR-2355) Avail: NTIS HC A03/MF A01 CSCL 12/1

Based upon the ray theory, we develop a systematic method to obtain an equation of K-dV type with variable coefficients for the evolution of water waves in a channel of nonuniform cross section. Examples for channels with a nonuniform rectangular and triangular cross section are given. The fission of solitions in a triangular channel with a shoal is studied by the inverse scattering method and also numerically. A general Green's law for the decay of wave amplitude in a channel with arbitrary cross section is derived. Author (GRA)

N82-31651# Research Triangle Inst., Research Triangle Park, N.C.
TES/HEAT-PUMP PERFORMANCE EVALUATION
Tony W. Sigmon 1981 7 p refs Presented at the Thermal and Chem. Storage Ann. Rev. Meeting, Washington, D.C., 14-16 Sep. 1981
(Contract W-7405-eng-26)
(DE82-000111; CONF-810940-18) Avail: NTIS HC A02/MF A01

A technique that utilizes a modified version of the conventional heat pump bin procedure to project use by thermal energy (TES) heat pump and conventional heat pump systems is described. Information for evaluation of various program alternatives for the development of TES/heat pump systems is presented. The modified bin procedure was used in conjunction with an annualized life cycle cost algorithm to evaluate each system from both a technical and economic perspective. Three levels of analysis were completed to identify the system or systems with the lowest life cycle cost for various application scenarios. More detailed analyses of the steady state performance and operation of selected systems are presented. DOE

N82-31652# Rasor Associates, Inc., Sunnyvale, Calif.
ENHANCED HEAT TRANSFER FOR THERMIONIC POWER MODULES
D. C. Johnson Jul. 1981 22 p refs
(Contract DE-AC02-76ET-11293)
(DE82-000728; DOE/ET-11293/T4; COO-2263-21; NSR-2-21) Avail: NTIS HC A02/MF A01

Heat transfer systems required for high heat fluxes (>20 w/sq cm) at high temperatures (>1500 K) which advanced thermionic power modules upon combustion systems are described. Energy transfer from the hot combustion gases may take place by convection, radiation, or a combination of radiation and convection. Enhanced convective heat transfer with a jet impingement system was demonstrated in a thermionic converter. The cellular ceramic radiative heat transfer system was applied to a thermionic converter. By comparing the jet impingement and cellular ceramic radiative heat transfer systems, an appropriate system may be selected for utilization in advanced thermionic power modules. DOE

N82-31653# State Univ. of New York, Buffalo. Lab. for Power and Environmental Studies.
AEROSOL AGGLOMERATION DUE TO ACOUSTICALLY INDUCED SHOCK WAVES
K. H. Chou, G. Rudinger, and D. T. Shaw 1981 21 p refs
(Contract DE-AC21-79MC-11842)
(DE82-011247; DOE/MC-11842/T6) Avail: NTIS HC A02/MF A01

For the experimental conditions of sound pressure levels at nodes I sub p between 160 to 166 db and resonance frequencies (f) between 680 to 2740 Hz in a resonance tube, the initiation of shock waves were found at I sub p > 160 db, and the shock waves occurred within + or - 20 Hz in the vicinity of f. In the presence of aerosols with the diameters d sub p of 0.2 to 1.0 sigma m, it was found that acoustically induced shock waves would enhance the rate of aerosol agglomeration. In addition to agglomerating aerosols, shock waves were able to drift aerosols towards nodes which would increase the local aerosol concentration at nodes and thus augmented the degree of agglomeration in an indirect way. An attempt was made to calculate the magnitude of drift velocity due to shock waves as a function of I sub p, f and d sub p. Time required for aerosols to drift from loop to node were computed for several cases and were in qualitative agreement with experimental observations. DOE

N82-31654# Los Alamos Scientific Lab., N. Mex.
REVERSE VORTEX FLOW IN NEAR-SURFACE EXPLOSIONS
Eric M. Jones and Rodney W. Whitaker Sep. 1981 16 p
(Contract W-7405-eng-36)
(DE82-001886; LA-8947-MS) Avail: NTIS HC A02/MF A01

Nuclear explosions conducted near the ground surface but higher than about 5 to 6 m/kt/sup 1/3/ produce a reverse flow (downward along the symmetry axis) after the shock wave is reflected from the ground. This reverse flow persists until destroyed by the buoyant rise of the fireball on time scales of several seconds. Six calculations of bursts with scaled heights of burst ranging upward from 15 m/kt/sup 1/3/ are described. The height of the reverse flow is a simple function of the burst height and explosion yield. DOE

N82-31655# Delft Hydraulics Lab. (Netherlands).
WAVE KINEMATICS AND FLUID LOADING IN IRREGULAR WAVES
J. Bosma and J. H. Vugts Nov. 1981 32 p refs Presented at Intern. Symp. on Hydrodyn. in Ocean Eng., Trondheim, Norway, 24-28 Aug. 1981
(Publ-259) Avail: NTIS HC A03/MF A01

The ability of a Gaussian random wave model to describe wave kinematics in a natural sea for engineering applications was investigated. Surface elevation and horizontal and vertical velocities were measured simultaneously in a flume. Nine wave spectra, covering a wide range of sea states, were studied. Measurements and prediction agree well for unidirectional waves, and the influence of directional spreading in multidirectional seas can be accommodated. Model representations of the kinematics in the free surface zone, and predictions of the tails of statistical distributions of surface elevation and velocities must be improved. Author (ESA)

N82-31656# Delft Hydraulics Lab. (Netherlands).
DISCRETE GAS MODEL TO REPRESENT DISTRIBUTED FREE GAS IN LIQUIDS
G. A. Provoost and E. B. Wylie (Michigan Univ.) Apr. 1982 11 p refs Presented at 5th Intern. Symp. on Water Column Separation, Obernach, West Germany, 28-30 Sep. 1981
(Publ-263) Avail: NTIS HC A02/MF A01

Transients in fluids containing free air which lumps the free gas at computational sections along, e.g., a pipeline, and treats the liquid between sections as if it were a liquid without free gas are modelled. In order to illustrate the influence of the procedure used to integrate the continuity equation at the discrete gas pockets, two examples, involving a single horizontal frictionless pipeline are given. In one, a transient is introduced by instantaneously lowering the upstream head from 60 m to 10.3 m (pipe level). In the other, upstream head is lowered to 30 m. Results for trapezoidal rule integration show high frequency oscillation after passage of sharp positive and negative pressure pulses. Forward integration results show numerical damping of the physical oscillation. Use of a small time increment reduces this effect. Author (ESA)

N82-31657# Technische Hogeschool, Delft (Netherlands). Lab. for Transport Engineering.
PRESSURE LOSSES IN PNEUMATIC TRANSPORT. A MODEL

BASED ON PARTICLE-WALL INTERACTIONS AND PARTICLE DENSITY DISTRIBUTION Ph.D. Thesis
J. A. Ottjes Jun. 1982 119 p refs
(WTHD-145) Avail: NTIS HC A06/MF A01

An experimentally verified model which calculates pressure losses originating from dilute phase pneumatic transport of coarse particles in the horizontal stationary flow regime is presented. The model is based on the balance of drag and frictional forces on particles. The particles are characterized by their terminal velocity, the particle-wall sliding friction coefficient and the coefficient of restitution between particles and wall. The influence of the inhomogeneous particle distribution in the pipe is taken into account, by a particle density distribution, which resembles the barometric height formula. A Froude number, based on the mean square value of the radial particle-velocity component, is used as an empirical parameter. This number increases with increasing average air velocity, but perhaps depends on pipe diameter and solids-mass flow. The assumption of a linear relationship between the Froude number and the average air velocity provides scaling and predicting possibilities for pressure losses. Author (ESA)

N82-31658# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
ON LOCAL-RELAXATION METHODS AND THEIR APPLICATION TO CONVECTION-DIFFUSION EQUATIONS
E. F. F. Botta and A. E. P. Veldman 4 Sep. 1981 44 p refs Submitted for publication
(NLR-MP-81052-U) Avail: NTIS HC A03/MF A01

A local relaxation (LR) method, based on successive over-relaxation (SOR) theory, is presented. The performance of LR methods is illustrated by applying them to central-difference approximations of convection-diffusion equations. It is found that equations with small diffusion coefficients can be handled without difficulty. For equations with strongly-varying coefficients, and for nonlinear equations, an LR method can be significantly more efficient than the optimum SOR method. For example, a 16 x 16 driven-cavity problem for a Reynolds number of one million can be solved in just a few seconds on a CDC 6600 computer.
Author (ESA)

N82-32059*# Gelles (S. H.) Associates, Columbus, Ohio.
PHASE SEPARATION IN TRANSPARENT LIQUID-LIQUID MISCIBILITY GAP SYSTEMS
S. H. Gelles, B. N. Bhat, and R. J. Laub (Ohio State Univ., Columbus) *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 3-17 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

N82-32060*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
MEASUREMENT OF DIFFUSION COEFFICIENTS FROM SOLUTION RATES OF BUBBLES
Irvin M. Krieger *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 18-20 ref (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

N82-32061*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INVESTIGATIONS ON TRANSPARENT LIQUID-MISCIBILITY GAP SYSTEMS
L. L. Lacy, G. Nishioka, and S. Ross (Rensselaer Polytechnic Inst., Troy, N.Y.) *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 21-35 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

N82-32062*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
MEASUREMENT OF SURFACE VELOCITY FIELDS
J. Adin Mann, Jr. *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 36-42 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

N82-32063*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
SURFACE TENSION DRIVEN CONVECTION
Simon Ostrach *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 43-51 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

N82-32064*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.
THE MIGRATION OF FLUID DROPLETS AND THEIR INTERACTIONS IN A THERMAL GRADIENT
R. S. Subramanian and W. R. Wilcox *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 53-57 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N82-31659* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHYROELECTRIC DETECTOR ARRAYS Patent
Archibald L. Fripp, James B. Robertson, and Roger A. Breckenridge, inventors (to NASA) Issued 29 Sep. 1980 4 p Filed 29 Sep. 1980 Supersedes N81-12389 (19 - 03, p 0347)
(NASA-Case-LAR-12363-1; US-Patent-4,341,012; US-Patent-Appl-SN-191748; US-Patent-Class-29-620; US-Patent-Class-29-576J; US-Patent-Class-29-576S; US-Patent-Class-250-332; US-Patent-Class-250-370) Avail: US Patent and Trademark Office CSCL 14B

A pryoelectric detector array and the method for making it are described. A series of holes formed through a silicon dioxide layer on the surface of a silicon substrate forms the mounting fixture for the pyroelectric detector array. A series of nontouching strips of indium are formed around the holes to make contact with the backside electrodes and form the output terminals for individual detectors. A pyroelectric detector strip with front and back electrodes, respectively, is mounted over the strip. Biasing resistors are formed on the surface of the silicon dioxide layer and connected to the strips. A metallized pad formed on the surface of the layer is connected to each of the biasing resistors and to the film to provide the ground for the pyroelectric detector array.
Official Gazette of the U.S. Patent and Trademark Office

N82-31660 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
TIME OF FLIGHT SPECTROMETER MEASUREMENT OF RECHARGING AND ENERGY LOSS IN CARBON FOILS ON IONS IN THE ENERGY DOMAIN FROM 10 TO 30 keV [FLUGZEITSPEKTROMETERMESSUNG VON UMLADUNG UND ENERGIEVERLUST IN KOHLENSTOFFOLIEN AN IONEN IM ENERGIEBEREICH VON 10 BIS 300 keV]
Achim Luhn Mar. 1982 86 p refs In GERMAN
(MPE-175; ISSN-0340-8922) Copyright. Avail: Issuing Activity

Energy loss and charged states of ions in and behind thin carbon foils were investigated to calibrate the satellite experiment SULEICA and to determine its resolving power. The SULEICA experiment combines an electrostatic analyzer with a time of flight spectrometer with carbon foil entrance window and a semiconductor detector, enabling energy, mass and charge of ions to be

determined. The energy loss results show that the foil is covered with 1 microg/sq cm water and gas molecules. The recharging measurements confirm the reduction of the average charge with velocity at higher energies. A connection between energy loss and average charge, as suggested by theoretical models, is not confirmed. Author (ESA)

N82-31661*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.

RADIATION EFFECTS STUDIES FOR THE HIGH-RESOLUTION SPECTROGRAPH Progress Report

L. C. Smith and Jacob Becher Aug. 1982 110 p refs

(Grant NsG-5289)

(NASA-CR-169273; NAS 1.26:169273; PTR-82-8) Avail: NTIS HC A06/MF A01 CSCL 14B

The generation and collection of charge carriers created during the passage of energetic protons through a silicon photodiode array are modeled. Pulse height distributions of noise charge collected during exposure of a digicon type diode array to 21 and 75 MeV protons were obtained. The magnitude of charge collected by a diode from each proton event is determined not only by diffusion, but by statistical considerations involving the ionization process itself. Utilizing analytical solutions to the diffusion equation for transport of minority carriers, together with the Vavilov theory of energy loss fluctuations in thin absorbers, simulations of the pulse height spectra which follow the experimental distributions fairly well are presented and an estimate for the minority carrier diffusion length L sub d is provided. S.L.

N82-31662*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EVALUATION OF AN ELECTRO-OPTIC REMOTE DISPLACEMENT MEASURING SYSTEM

James H. Monteith and Marian L. Kroen Jul. 1982 29 p refs

(NASA-TM-84530; NAS 1.15:84530) Avail: NTIS HC A03/MF A01 CSCL 14E

An instrumentation system to provide a noncontact method for measurement of target positions was evaluated. The system employs two electro-optic camera units which give stereo information for use in determining three dimensional target locations. Specially developed, infrared sensitive photodetectors are used in the cameras to sense radiation from light emitting diode targets. Up to 30 of these targets can be monitored with a sampling rate of 312 Hz per target. An important part of the system is a minicomputer which is used to collect the camera data, sort it, make corrections for distortions in the electro-optic system, and perform the necesssary coordinate transformations. If target motions are restricted to locations in a plane which is perpendicular to a camera's optical axis, the system can be used with just one camera. Calibrations performed in this mode characterize accuracies in single camera operation. This information is also useful in determination of single camera contributions to total system errors. For this reason the system was tested in both the single camera and two camera (stereo) modes of operation. S.L.

N82-31663*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT AND UTILIZATION OF A LASER VELOCIMETER SYSTEM FOR A LARGE TRANSONIC WIND TUNNEL

Robert J. Freedman and John P. Greissing Jun. 1982 17 p refs

(NASA-TM-82886; E-1264; NAS 1.15:82886) Avail: NTIS HC A02/MF A01 CSCL 14B

The need for measurements of the velocity flow field about spinner propeller nacelle configurations at Mach numbers to 0.8 was met by a specially developed laser velocimeter system. This system, which uses an argon ion laser and 4 beam 2 color optics, was required to operate in the hostile environment associated with the operation of a large transonic wind tunnel. To overcome the conditions present in locating the sensitive optics in close proximity to the wind tunnel, an isolation system was developed. The system protects the velocimeter from the high vibrations, elevated temperatures, destructive acoustic pressures and low atmospheric pressures attendant with the operation of the wind tunnel. The system was utilized to map the flow field in front of, behind and in between the rotating blades of an advanced swept blade propeller model at a Mach number of 0.8. The data collected by the system will be used to correlate and verify computer analyses of propeller nacelle flow fields and propeller performance. R.J.F.

N82-31664*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A DIGITAL OPTICAL TORQUEMETER FOR HIGH ROTATIONAL SPEED APPLICATIONS

Daniel J. Lesco, Donald R. Buchele, and Lawrence G. Oberle Aug. 1982 17 p refs

(NASA-TM-82914; E-1189; NAS 1.15:82914) Avail: NTIS HC A02/MF A01 CSCL 14B

A digital optical torquemeter system designed for applications at high rotational speeds was fabricated and tested for zero stability at speeds up to 20,000 rpm. Data obtained in a spin rig and with simulated inputs demonstrate that the system is capable of measuring torque bar twist to within 0.03 degrees at speeds of 30,000 rpm. The optical system uses fiber optic bundles to transmit light to the torque bar and to silicon avalanche detectors. The system is microcomputer based and provides measurements of average torque and torque as a function of angular shaft position. The torquemeter requires no bearings or other contact between the rotating torque bar and the nonrotating optics, and tolerates movement of the torque bar as large as 1 mm relative to the optics. R.J.F.

N82-31665# California Univ., Livermore. Lawrence Livermore Lab.

NEUTRON PERSONNEL DOSIMETRY

Richard V. Griffith 16 Jun. 1981 37 p refs Presented at the Health Phys. Soc. Summer School, Louisville, Ky., 16 Jun. 1981

(Contract W-7405-eng-48)

(DE82-003176; UCRL-85881) Avail: NTIS HC A03/MF A01

The current state of the art in neutron personnel dosimetry is reviewed. Topics covered include dosimetry needs and alternatives, current dosimetry approaches, personnel monitoring devices, calibration strategies, and future developments. DOE

N82-31666# Army Missile Command, Redstone Arsenal, Ala.

FABRICATION OF HOLOGRAPHIC OPTICAL ELEMENTS FOR ACHROMATIC MATCHED FILTERING SYSTEM

T. G. Georgekutty and J. G. Duthie 27 Jan. 1982 15 p refs

(AD-A116283; AD-E950250; DRSMI/RR-82-2-TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Holographic optical elements such as lenses, gratings and holographic matched filters were fabricated for an achromatic matched filtering system. Diffraction efficiencies of more than 90% were obtained in all these elements. These holographic elements were used in the achromatic matched filtering system and achromatic Fourier transforms were obtained. Experimental details involved in all these methods are briefly described. Author (GRA)

N82-31667# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

DESIGN AND EVALUATION OF A PRESSURE SENSOR FOR HIGH TEMPERATURE NUCLEAR APPLICATION

M. E. Yancey Nov. 1981 34 p refs

(Contract DE-AC07-76ID-01570)

(DE82-003493; EGG-2135) Avail: NTIS HC A03/MF A01

A small eddy current pressure sensor for use within a high temperature nuclear environment was developed. The sensor is designed for use at pressures and temperature of up to 17.23 MPa and 650 F. The design of the sensor incorporated features to minimize possible errors due to temperature transients present in nuclear applications. A prototype pressure sensor that was designed, the associated 100 kHz signal conditioning electronics, and the evaluation tests which were conducted are described. DOE

N82-31668# Pacific Northwest Lab., Richland, Wash.
DEVELOPMENT OF THE IMPROVED CORROSION RATE METER AND EVALUATION OF COMMERCIALLY DEVELOPED HIGH-TEMPERATURE pH ELECTRODES Interim Report, period ending Sep. 1981
M. J. Danielson Jan. 1982 31 p refs
(Contract DE-AC06-76RL-01830)
(DE82-007873; PNL-4134) Avail: NTIS HC A03/MF A01

The continued development of the improved corrosion rate meter (ICR) and the initial laboratory evaluation of commercially developed pH electrodes are discussed. The objective of this work is to develop a more flexible instrument that would respond with correct corrosion rates under a wider range of conditions. The ICR was successfully tested in the field and in the laboratory. Although commercial corrosion rate meters (CCRs) are adequate for many situations, the ICR is the most versatile instrument and gives more accurate corrosion rate measurements. Glass and ceramic pH electrodes were tested at 850 C and 2000. None of the electrodes performed well at 2000 C. The ceramic electrode performed well at 2000 C and is worthy of further development. DOE

N82-31669# Brookhaven National Lab., Upton, N. Y. Physics Dept.
NEW IDEAS AND DEVELOPMENTS IN CALORIMETRY
Howard A. Gordon 1981 4 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE82-003676; BNL-30275; CONF-811012-27) Avail: NTIS HC A02/MF A01

Some ideas for calorimeters are described: (1) the test of a parallel plate calorimeter; (2) the use of vacuum photodiodes for calorimeters operating in a magnetic field; and (3) the attempt to build high pressure gas sealed tubes as ion chambers in hadron calorimeters. Molded plastic loaded with heavy metal for the inert material in gas calorimeters and the use of the limited streamer mode in calorimeters are also described. DOE

N82-31670# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
EVALUATION OF THE NEW-GENERATION RCA 8854 PHOTOMULTIPLIER
C. C. Lo and Branko Leskovar Oct. 1981 8 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981 Sponsored in part by DUMAND Hawaii Center
(Contract W-7405-eng-48)
(DE82-002951; LBL-13489; CONF-811012-24) Avail: NTIS HC A02/MF A01

Characteristics were measured for a 114 mm diameter photomultiplier. The first dynode of this photomultiplier has a cesium activated, gallium phosphide secondary emitting surface. Some typical photomultiplier characteristics - such as gain, dark current and risetime - are compared with data provided by the manufacturer. Photomultiplier characteristics also measured include pulse height spectrum and time spectrum of afterpulses. In addition, measurements were made of the collection and quantum efficiency uniformity and of the single photoelectron time spread for the full photocathode illumination. Measurement techniques and description of measuring systems are given. DOE

N82-31671# Sandia Labs., Albuquerque, N. Mex.
THERMAL-DESORPTION MEASUREMENTS FOR ESTIMATING BAKEOUT CHARACTERISTICS OF VACUUM DEVICES
L. Beavis Nov. 1981 26 p refs Presented at Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001777; SAND-81-1372C; CONF-81113-18) Avail: NTIS HC A03/MF A01

This discussion will be confined to outgassing phenomena; although gettering (sinks) or permeation (transfer through the entire vacuum wall) are imported in long term prediction. Measuring outgassing rates directly is complicated by the dynamic interaction between the samples being measured and the apparatus in which the measurements are made. Thermoesorption data are presented for molybdenum, nickel, Fe-Ni-Co alloy, copper, Cu-Be alloy, molybdenum sealing glass ceramic, and high-alumina ceramic. DOE

N82-31672# California Univ., Livermore. Lawrence Livermore Lab.
SUMMARY OF LOW-RESISTANCE MANGANIN GAUGE DEVELOPMENT AT LAWRENCE LIVERMORE NATIONAL LABORATORY
L. M. Erickson, C. B. Johnson, H. C. Vantine, R. C. Weingart, and R. S. Lee (Kansas State Univ., Manhattan) 20 Aug. 1981 13 p refs Presented at the 1st Symp. on Gages and Piezoresistive Mater., Arcachon, France, 29 Sep. - 1 Oct. 1981
(Contract W-7405-eng-48)
(DE81-030476; UCRL-85772; CONF-810931-4) Avail: NTIS HC A02/MF A01

The development and calibration of stress gauges suitable for use in explosives are discussed. Stress gauges which can be used in multidimensional flows are also considered. DOE

N82-31673# California Univ., Livermore. Lawrence Livermore Lab.
ADAPTIVE DIGITAL CONTROL OF HIGH-SPEED ROTATING-MIRROR CAMERAS
Anthony N. Payne 3 Aug. 1981 6 p refs Presented at the IECI, San Francisco, 9-12 Nov. 1981
(Contract W-7405-eng-48)
(DE81-028798; UCRL-86525; CONF-811110-1) Avail: NTIS HC A02/MF A01

A digital speed controller for high speed rotating mirror cameras is described. The microprocessor based controller employs an adaptive control algorithm to cope with the uncertainties and nonlinearities inherent in the camera system dynamics. Simulation and experimental results that demonstrate the merits of the algorithm are discussed. DOE

N82-31674# California Univ., Livermore. Lawrence Livermore Lab.
STREAKED, X-RAY-TRANSMISSION-GRATING SPECTROMETER
N. M. Ceglio, M. Roth, and A. M. Hawryluk (MIT) Aug. 1981 11 p Presented at the Top. Conf. on Low-energy X-ray Diagnostics, Monterey, Calif., 8-10 Jun. 1981
(Contract W-7405-eng-48)
(DE81-000844; UCRL-86091; CONF-810651-11) Avail: NTIS HC A02/MF A01

A free standing X-ray transmission grating coupled with a soft X-ray streak camera to produce a time resolved X-ray spectrometer is described. The instrument has a temporal resolution of approximately 20 psec, is capable of covering a broad spectral range, 2 to 120 A, has high sensitivity, and is simple to use requiring no complex alignment procedure. In recent laser fusion experiments the spectrometer successfully recorded time resolved spectra over the range 10 to 120 A with a spectral resolving power (lambda/delta of 4 to 50) limited primarily by source size and collimation effects. DOE

N82-31675# California Univ., Livermore. Lawrence Livermore Lab.
WIDE-RANGE MONITOR FOR PULSED X-RAY SOURCES
R. C. Kaifer, T. E. Jenkins, and T. Straume 12 Oct. 1981 5 p ref Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contract W-7405-eng-48)
(DE82-001639; UCRL-85937; CONF-811012-4) Avail: NTIS HC A02/MF A01

A monitoring instrument based on a high pressure ionization chamber that measures average dose rates as low as 0.1 mR/h and responds linearly to short pulses at dose rates up to 1.2 x 10 to the 10th power R/h is described. Its sensitivity can be remotely changed by a factor of 10,000, to enable accurate measurement of both background radiation and very high intensities such as

can be expected from accelerator beam spills. Its detector electrometer pulse response was measured using a dose calibrated field emission accelerator having a 30 ns pulse width. DOE

N82-31676# Sira Inst. Ltd., Chislehurst (England).
EVALUATION OF THE FAIRCHILD TYPE 55/2 TDI CCD IMAGE ARRAYS Final Report
D. J. Purll Paris ESA Mar. 1982 130 p refs
(Contract ESTEC-4253/80)
(SIRA-6/5746/00; ESA-CR(P)-1597) Avail: NTIS HC A07/MF A01

The suitability of a time delay and integration (TDI) CCD image sensor (developed for a low light level periscope scanning application) for pushbroom scanning in spaceborne Earth imaging radiometers such as the optical imaging instrument (OII) on the European LASS satellite (ERS-2) was assessed. The use of TDI arrays presents no greater problems than linear arrays in terms of nonuniformity calibration, and noise and resolution performance. The spectral response is less smooth and more variable than in linear arrays which do not have electrode structures on the imaging surface. Author (ESA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-31677# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
LASER ULTRASOUND FOR NONDESTRUCTIVE TESTING Interim Report
William R. Scott 12 Mar. 1982 19 p
(AD-A116397; NADC-81213-60) Avail: NTIS HC A02/MF A01 CSCL 20/5

Noncontact techniques for generating and detecting high frequency ultrasonic waves (> 1 MHz) are being explored using pulsed laser thermoelastic transduction and heterodyne interferometry respectively. In addition, holographic projection techniques are being investigated for beam shaping and beam steering of the thermoelastic waves. Possible applications of this technology include performance of ultrasonic nondestructive testing in hostile or inaccessible environments. GRA

N82-31678# Naval Postgraduate School, Monterey, Calif.
OPTICAL SCINTILLATION MEASUREMENTS FOR SINGLE AND FOLDED PATHS M.S. Thesis
Thomas Joseph Hodgini Mar. 1982 73 p refs
(AD-A116291) Avail: NTIS HC A04/MF A01 CSCL 20/14

A method of measuring scintillation of two laser beams propagating along single and folded optical paths has been devised, tested, and satisfactorily utilized. The system was utilized experimentally to verify theoretical predictions of the correlation of the two paths as a function of the relative path geometry. The apparatus utilized alternating optical pulses from the two paths. The detection system employed two signal processing channels with electronic switching to permit sampling alternating source pulses with a time separation of 0.30 milliseconds. Several equipment trials and one field experiment were conducted. The results demonstrated good correlation with the theory previously developed in an accompanying project. GRA

N82-31679# Naval Research Lab., Washington, D. C.
AN EXPERIMENTAL STUDY OF THE HYDRODYNAMICS OF REDUCED DENSITY CHANNELS Interim Report
J. R. Greig, R. E. Pechacek, M. Raleigh, and K. A. Gerber 10 Jun. 1982 34 p refs
(ARPA Order 4395)
(AD-A116408; NRL-MR-4826) Avail: NTIS HC A03/MF A01 CSCL 20/5

The formation and decay of reduced density channels in gaseous atmospheres was studied using a novel method to produce channels in nitrogen by the absorption of pulsed carbon dioxide laser radiation. These experiments were performed in a chamber consisting of three regions: a nonabsorbing convergence section filled with pure nitrogen in which the CO2 laser beam was focused to small diameter and high intensity; a windowless transition region; and an absorption section filled with nitrogen containing a small percentage of SF6. The amount of laser energy absorbed in the gas (about or greater than 0.4 J/cc) and the radius of the laser beam (about 2mm) were measured throughout the absorption section. The radial density profile of the resulting channel was determined as a function of time by several optical methods. Hydrocode simulations of the evolution of the radial density profile of the channel were performed based on the measured initial conditions and agree with the measured results for the first about 100 microseconds of the life of the channel. GRA

N82-31680# Los Alamos Scientific Lab., N. Mex.
EFFICIENT METHOD THAT PRECISELY CHARACTERIZES LASER-TARGET DEFECTS MORE COMPLEX THAN NON-CONCENTRICITY
R. L. Whitman 1981 15 p refs Presented at the Am. Vacuum Soc. 28th Natl. Symp., Anaheim, Calif. 3-6 Nov. 1982
(Contract W-7405-eng-36)
(DE82-000585; LA-UR-81-2674; CONF-811113-21) Avail: NTIS HC A02/MF A01

An expansion of an efficient, fast Fourier technique for precisely characterizing complex laser target defects is described. The defects characterized are the traditional nonconcentricities and the more complex ellipticites and higher-order wall nonuniformities in single-layered targets. This characterization method uses experimentally derived molybdenum step-wedge data. The molybdenum steps (12.5 micrometer) were exposed to a 45-kV tungsten-bremsstrahlung source and were recorded on holographic plate emulsion. Using the step-wedge data, targets with 6.25 micrometers-wall thickness and diameters of 150 micrometer and 300 micrometer were modeled with nonconcentricities and ellipticities. Sensitivities of +- 1/2 to 1% for nonconcentric defects and +-1.4 to 2.8% for elliptic defects were calculated for target diameters between 300 micrometer and 150 micrometer, respectively. In addition, modeled targets with a combination of nonconcentric and elliptic defects were easily characterized in the presence of film noise. DOE

N82-31681# Los Alamos Scientific Lab., N. Mex.
THE 28-NM LASER DAMAGE TESTING OF LIF
Stephen R. Foltyn and Brian E. Newman 1981 10 p Presented at the 13th Ann. Boulder Damage Symp., Boulder, Colo., 17-18 Nov. 1981
(Contract W-7405-eng-36)
(DE81-030133; LA-UR-81-2544; CONF-811117-1) Avail: NTIS HC A02/MF A01

Samples of LIF, both single crystal and press forged were tested for damage resistance to 10 ns 248 nm pulses at 35 pps. The damage thresholds the highest levels at which no damage could be produced - ranged from 4 to 6 J/sq cm although some test sites survived irradiation at approximately 30 J/sq cm. Bulk damage is the primary failure mechanism in single crystal and press forged samples and both samples exhibit the same resistance to laser damage. DOE

N82-31682# Minnesota Univ., Minneapolis. Dept. of Chemistry.
INFRARED LASER INDUCED ORGANIC REACTIONS Progress Report, 15 Oct. 1981
William E. Farneth 15 Oct. 1981 16 p ref
(Contract DE-AC02-80ER-10592)
(DE82-007951; DOE/ER-10592/T1) Avail: NTIS HC A02/MF A01

The competition among activation, deactivation and unimolecular chemical reaction in laser irradiated organic vapors was investigated. The following compounds were studied; vinylcyclopropane; bicyclopropyl-d4; diethylcarbonate-d5. Details of these investigations are provided. As an outgrowth of these experiments, single photon vibrational overtone excitation of organic molecules was also investigated. Infrared laser activation of mechanically more complex reactions were investigated. These were laser

induced reactions in gas/solid mixtures (surface chemistry of graphite and 2-propanol/CuO), and laser-induced chemiluminescence (octane decomposition). DOE

N82-31683# California Univ., Livermore. Lawrence Livermore Lab.
X-RAY-TRANSPORT EFFECTS IN LASER-IRRADIATED DISKS
R. L. Kauffman, D. L. Matthews, and R. W. Lee (Blackett Lab. for Spectroscopy, Imperial Coll., London) 6 Oct. 1981 14 p refs Presented at the 23rd. Ann. Meeting of the Div. of Plasma Phys. of the APS, New York, 12-16 Oct. 1981
(Contract W-7405-eng-48)
(DE82-002595; UCRL-86406; CONF-811028-4) Avail: NTIS HC A02/MF A01

. X-ray emission spectra are important diagnostics for studying laser coupling and energy transport. The sensitivity of such measurements to the plasma density and temperature profiles are explored. The one dimensional radiation transport equation is solved for various temperature and density profiles. Spectra are calculated in both the LTE and CRE approximations, bracketing the relevant regimes. Their applicability to real plasmas is discussed. The calculated spectra are compared with measurements from different Z targets. This comparison explores the possible temperature and density parameters. Such comparisons can be used to interpret experimental results as well as guide the design of experiments. DOE

N82-31684# California Univ., Livermore. Lawrence Livermore Lab.
CONTROLLING KINETIC PARAMETERS OF 100 W LARGE BORE COPPER VAPOR LASERS
B. E. Warner and M. J. Kushner 15 Jan. 1982 21 p refs Presented at the Intern. Conf. on Lasers, New Orleans, 14-16 Dec. 1981
(Contract W-7405-eng-48)
(DE82-009335; UCRL-85313; CONF-811229-8) Avail: NTIS HC A02/MF A01

A self consistent computer model is used to extract controlling kinetic parameters of large bore (6 to 8 cm diameter) 60 to 100 W copper vapor lasers. Optimum conditions for upper laser level discharge pumping, lower level deactivation and volumetric scaling of these high repetition rate lasers are discussed. DOE

N82-31685# Los Alamos Scientific Lab., N. Mex.
UNRESOLVED PROBLEMS IN GRASER DEVELOPMENT
G. C. Baldwin and J. C. Solem 1981 7 p refs Presented at the LASER's Ann. Conf., McLean, Va., Dec. 1981
(Contract W-7405-eng-36)
(DE82-008128; LA-UR-82-321; CONF-811232-1) Avail: NTIS HC A02/MF A01

Although it has been recognized for two decades that the Mossbauer effect offers the possibility of stimulated emission from nuclear states, the contradictory requirements of an intense pump and a relatively undisturbed solid host continue to frustrate attempts to devise a workable gamma ray laser system. The basic requirement for gain and some recent proposals for satisfying it are reviewed identifying the difficulties each proposal presents. Finally, the kinds of information, experience, and ideas that may enable further progress are suggested. DOE

N82-31686# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
COPPER LASER DIAGNOSTICS AND KINETICS SUPPORT
Dec. 1981 19 p refs
(Contract W-7405-eng-48)
(DE82-011051; UCRL-15432; MSNW-1182) Avail: NTIS HC A02/MF A01

A pulsed interferometric hook diagnostic package was developed. The diagnostic package included a dye laser, interferometer, electronic recording instrumentation, mechanical chopper for pulse selection, and a master timing/triggering unit to provide properly timed trigger pulses to fire the dye laser pump and the laser being diagnosed. A copper vapor laser media was provided to be diagnosed. Preliminary testing consisting of pulsed density measurements of Xe metastables in an ZeCL laser using as dye laser pump and spectrometer were performed to checkout the apparatus. DOE

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-31687# Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo (Japan).
WELDING OF AL-MG ALLOY 5083-0 FOR THE CONSTRUCTION OF LNG STORAGE TANKS
Yoshikazu Kuriyama, Kazuyuki Minoda, Toshio Irisawa, and Hideyuki Nagaoka 15 Apr. 1981 29 p refs Presented at the IIW-JIW Colloq. Prod. Technol. and Quality Assurance, Nagoya, Japan, 15 Apr. 1981 Sponsored in part by the Welding Research Inst., Japan Prepared in cooperation with Shin-Nakahara-Cho, Yokohama, Japan
Avail: NTIS HC A03/MF A01

Welding processes of 5083-0 thick plates, mechanical properties of the welded joints and measures for the prevention of weld defects, intended mainly LNG tank construction are studied. The followings are the main contents of this article. The welding processes currently applied for assembling large LNG tanks are conventional MIG, high current MIG and DCSP TIG, all of which are fully automated. The principal applications of automatic welding are as follows: (1) high current MIG process done on ground for assembling two to three panels into a block using large diameter (3.2 to approximately 4.8 mm) filler wire, and (2) mechanized all position MIG process for erection welding of the aforementioned blocks of tank shell and for the welding of filler joints of bottom and roof plates. S.L.

N82-31688*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SLIDE RELEASE MECHANISM Patent Application
James W. Bunker (TransTechnology Corp., Canyon Country, Calif.) and Robert S. Ritchie, inventors (to NASA) (TransTechnology Corp., Canyon Country, Calif.) Filed 30 Jun. 1982 13 p Sponsored by NASA
(NASA-Case-MSC-20080-1; US-Patent-Appl-SN-393584) Avail: NTIS HC A02/MF A01 CSCL 13I

An explosive type disconnect device in which the force activating the device is at 90 deg to the load axis is described. This device will be used to separate the external tank starting with STS-10. The disconnect device consists mainly of a box shaped body, a guide sleeve, a slider latch, a load carrying shank, and the follower. The overall organization is illustrated. To assemble the device, the attenuator is slipped over the end of slider and the assembly is positioned in the open end of the body. The aperture in the slider is aligned with opposed apertures in the body and the sleeve is slipped through the apertures until its collar abuts the body. By rotating the sleeve until its webs line up with slider slot, the slider can be moved into the body capturing the sleeve. The shank can then be slipped loosely through the sleeve and the slider driven home with its slots latched against the slider rails and firmly held there by a compression spring and follower is cover threadedly attached to the sleeve as the basic load carrying and releasing elements. NASA

N82-31689*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONNECTION SYSTEM Patent Application
Bruce McCandless, II, inventor (to NASA) Filed 30 Jun. 1982 20 p
(NASA-Case-MSC-20319-1; US-Patent-Appl-SN-393582) Avail: NTIS HC A02/MF A01 CSCL 13I

The instant invention relates to a connection system applicable to composite tools, such as a socket and wrench handle, where

the interconnected parts move relative to one another is described. Means are provided for positive control over each component part of the assembly, to prevent dropping or loss of a component part during use. This is of great importance in certain circumstances such as extravehicular activities in space, subsurface marine operations, or where dropping or loss of a component part could damage machinery or endanger personnel. The connection system comprises a receptable in one component of the tool, and a pin on the other component matably receivable in the receptacle. A primary latch engages to retain pin in the receptacle. A lock member on the component is operably associated with the latch to selectively maintain its engagement or permit its release by operation of an actuator which is selectably insertable into the component. NASA

N82-31690*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CAM CONTROLLED RETRACTABLE DOOR LATCH Patent Application
Renton B. Carsley, inventor (to NASA) (Rockwell International Corp., Pittsburgh) 30 Jun. 1982 11 p Sponsored by NASA
(NASA-Case-MSC-20304-1; US-Patent-Appl-SN-393585) Avail: NTIS HC A02/MF A01 CSCL 13I

A latching mechanism in which there is linear movement and rotational movement is described. The umbilical doors of the space shuttle orbiter are required to be open during vehicle launch. After the external tank is released, the doors are closed. Presently, the device for maintaining the doors in an open position is mounted on the external tank and therefore has a single mission life. The latching mechanism of the invention is mounted in the orbiter and therefore is returned and has multimission capability. The latching mechanism is comprised of a pair of concentric nested, cylindrical cams and motors to actuate the cams, and latch pin all contained within a cover mounted on a support bracket carried by the substructure. A shaft having a latch pin is mounted inside the inner cylindrical cam. NASA

N82-31691*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFLUENCE OF CORROSIVE SOLUTIONS ON MICROHARDNESS AND CHEMISTRY OF MAGNESIUM OXIDE /001/ SURFACES
Hiroyuki Ishigaki (Osaka Univ.), Kazuhisa Miyoshi, and Donald H. Buckley Aug. 1982 11 p refs
(NASA-TP-2040; E-1035; NAS 1.60:2040) Avail: NTIS HC A02/MF A01 CSCL 20K

X-ray photoelectron spectroscopy analyses and hardness experiments were conducted on cleaved magnesium oxide /001/ surfaces. The magnesium oxide bulk crystals were cleaved to specimen size along the /001/ surface, and indentations were made on the cleaved surface in corrosive solutions containing HCl, NaOH, or HNO3 and in water without exposing the specimen to any other environment. The results indicated that chloride (such as MgCl2) and sodium films are formed on the magnesium oxide surface as a result of interactions between an HCl-containing solution and a cleaved magnesium oxide surface. The chloride films soften the magnesium oxide surface. In this case microhardness is strongly influenced by the pH value of the solution. The lower the pH, the lower the microhardness. Sodium films, which are formed on the magnesium oxide surface exposed to an NaOH containing solution, do not soften the magnesium oxide surface. Author

N82-31692# Franklin Research Center, Philadelphia, Pa.
INVESTIGATION OF HYDRAULIC BUMP IN SIMULATOR ELECTROHYDRAULIC CONTROLS Final Report
C. A. Belsterling, K. S. Fertner, and J. Stone Aug. 1981 117 p
(Contract F33657-80-C-0206; AF Proj. 2325)
(AD-A116106; FRC-F-C5364; ASD-TR-81-5033) Avail: NTIS HC A06/MF A01 CSCL 13/7

The report covers a series of experimental tests to determine the effect of cylinder and servovalve design on the magnitude of acceleration noise and hydraulic bump in simulator electrohydraulic controls. It includes tests on systems comparing equal with unequal area cylinders and high gain with low gain servovalves. The results indicate significant benefits with equal area cylinders and low gain servovalves. Author (GRA)

N82-31693# Naval Postgraduate School, Monterey, Calif.
CHARACTERISTICS OF A FOUR-NOZZLE, SLOTTED SHORT MIXING STACK WITH SHROUD, GAS EDUCTOR SYSTEM M.S. Thesis
Carl John Drucker Mar. 1982 280 p refs
(AD-A116304) Avail: NTIS HC A13/MF A01 CSCL 21/5

Cold flow tests were conducted on a four nozzle (nozzles tilted at a 15 deg angle) gas eductor system to evaluate the system's performance using a short slotted mixing stack and two shrouds with diffuser rings. The stack length-to-diameter ratio, (L/D), was 1.0, and the shroud and diffuser rings extended the L/D to 1.5. The difference in the two shrouds was the separation distance between stack and shroud and between shroud and diffuser rings. This separation distance resulted in exit diffuser angles of 10.8 and 7.3 deg. The nozzles were constructed with a ratio of total area of primary flow to area of mixing stack of 2.5. Secondary and tertiary pumping coefficients, mixing stack pressure distributions, and exit velocity profiles were used to evaluate the shrouded mixing stacks. The stack and shrouds were evaluated with the stack slots closed and then open. Secondary pumping was found to be independent of changes in diffuser angle. Tertiary pumping decreased with the separation distance and only showed a slight increase when the slots were opened. The 7.3 deg shroud had a lower tertiary flow; however, in the regions of low flow at the exit plane, the severity of performance was achieved. GRA

N82-31694# AiResearch Mfg. Co., Torrance, Calif.
ELECTROMECHANICAL ACTUATION DEVELOPMENT PROGRAM (EADP). POWER CONTROL DEVELOPMENT Final Report, Jul. 1980 -Sep. 1981
Stephen Rowe, David Bailey, and Robert Belanus Wright-Patterson AFB, Ohio AFWAL Sep. 1981 146 p
(Contract F33615-80-C-3620; AF Proj. 2403)
(AD-A116126; AMC-81-18106; AFWAL-TR-81-3106) Avail: NTIS HC A07/MF A01 CSCL 20/3

Electromechanical actuation of primary flight control surfaces has been demonstrated by the development of an integrated rotary hingeline dual-redundant actuation unit. Improved system bandwidth was demonstrated after employing improved sensors and electronic controls. Author (GRA)

N82-31695# California Univ., Livermore. Lawrence Livermore Lab.
OVERVIEW OF THE MACHINE-TOOL TASK FORCE
G. P. Sutton 8 Jun. 1981 27 p Presented at the Soc. of Carbide and Tool Engr. Conf., Chicago, 8 Jun. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE82-003186; UCRL-86002; CONF-8106169-1) Avail: NTIS HC A03/MF A01

The state of the art of machine tool technology for material removal was surveyed. The approach, specific subjects covered, principal conclusions and some of the key recommendations aimed at improving the technology and advancing the productivity of machine tools are summarized. DOE

N82-31696# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF NITRONIC 50 FUSION WELDING TECHNIQUES FOR 4 K SERVICE
E. N. C. Dalder and Mary C. Juhas 23 Sep. 1981 12 p refs Presented at the Cryogenic Eng. Conf., San Diego, Calif., 10-14 Aug. 1981
(Contract W-7405-eng-48)
(DE82-003059; UCRL-86835; CONF-810835-36) Avail: NTIS HC A02/MF A01

The mirror fusion test facility (MFTF-B) is a large magnetic fusion energy experiment in the tandem mirror configuration. The requirement that each pair of yin-yang magnets, one pair at each

end of the experiment, not undergo lateral motion during seismic events was found to require excessively thick (>12.7 mm) walled tubing in the support its struts, which accelerated the flow of heat inward to the 4 K magnet case from the nearby 300 K wall of the reactor vessel, when any of the Cr-Ni austenite stainless steels, such as Type 304 with a 300 K yield-strength of 307 mpa (min.) was considered. Since the cold end of the lateral restraining strut was to be at or near 4 K, the additional constraints a good austenite stability and resistance to brittle fracture at 4 K existed. After consideration of these constraints against available information on Cr-Ni and Cr-Mn-Ni-N2 austenitic stainless steels, grade XM-19 (FE-22 Cr-12 Ni-5 Mn-.04 C-.02 N2 was chosen. The mechanical properties of these welds were studied. DOE

N82-31697# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
LONG RANGE PLAN FOR FLEXIBLE JOINT DEVELOPMENT PROGRAM
[1982] 30 p refs
(Contract DE-AT03-76SF-76026)
(DE81-029311; DOE/SF-76026/T82) Avail: NTIS HC A02/MF A01

Bellows expansion joints were incorporated into CDS and subsequent LMFBR and liquid metal applications. An assessment was performed on the use of Incoloy 800H and Inconel 718 as bellows materials. DOE

N82-31698# Mound Lab., Miamisburg, Ohio.
EFFECT OF SEVERAL SURFACE TREATMENTS ON THE STRENGTH OF A GLASS CERAMIC-TO-METAL SEAL
D. P. Kramer, R. F. Salerno, and E. E. Egleston 10 Feb. 1982 9 p refs
(Contract DE-AC04-76DP-00053)
(DE82-007870; MLM-2893) Avail: NTIS HC A02/MF A01

Test shells of Inconel 625, Inconel 718, 21-6-9 stainless steel, and Hastelloy, C-276 were plasma and/or chemically cleaned before sealing with a multicomponent glass ceramic to metal seal was evaluated using a hydrostatic burst test. It is shown that plasma cleaning can be used to increase the hydrostatic burst strength and hermeticity of a glass ceramic to metal seal. DOE

N82-31699# Sandia Labs., Albuquerque, N. Mex.
MODELING TURBINE-MISSILE IMPACTS USING THE HONDO FINITE ELEMENT CODE
K. W. Schuler Nov. 1981 56 p refs
(Contract DE-AC04-76DP-00789)
(DE82-006875; SAND-80-2627) Avail: NTIS HC A04/MF A01

The dynamic finite element code HONDO simulated a full scale rocket sled test. In the test a rocket sled was used to launch at a velocity of 150 m/s, a 1527 kg fragment of a steam turbine rotor disk into a structure which was a simplified model of a steam turbine casing. Energy absorbing characteristics were assessed in the calculations of the material behavior of and boundary conditions on the target structure. The calculations and observations of missile velocity and strain histories of various points of the target structure are compared. DOE

N82-31700# Sandia Labs., Livermore, Calif. Materials Development Div.
INERTIA WELDING OF COPPER AND BRASS TO Ti-6Al-6V-2Sn
M. W. Mote Jan. 1982 10 p ref
(Contract DE-AC04-76DP-00789)
(DE82-010213; SAND-81-8030) Avail: NTIS HC A02/MF A01

Strong, tough, inertia welds between Ti-6Al-6V-2Sn alloy and copper without altering the microstructure of the titanium alloy were made. It is shown that inertia welds between this titanium alloy and a brass give lower strength and greater variation in strength. DOE

N82-31701# Brobeck (William M.) and Associates, Berkeley, Calif.
REVIEW OF TESTING AND EVALUATION OF AN IMPROVED STEAM ENGINE
Dec. 1981 49 p refs
(Contract DE-FG01-80CS-50225)
(DE82-011258; DOE/NBM-1000) Avail: NTIS HC A03/MF A01

An experimental steam engine was tested and evaluated. The purpose of the project was to improve the thermal efficiency of a small steam power system. A thermal efficiency of 24% was achieved, based on a net system power output of 28 horsepower. While this was a noteworthy improvement over 22% achieved a year earlier, it was short of the goal of 27%. Analysis has shown that 27% is attainable with further engineering development. Design modifications which can lead to improved efficiency are discussed. DOE

N82-31702# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abt. Mechanik.
INVESTIGATIONS ON THE FLATTENING DURING THE TOUCHING OF FLAT AND V-GROOVES WITH STEEL BALLS Ph.D. Thesis - Tech. Univ. Carolo-Wilhelmina [UNTERSUCHUNGEN ZUR ABPLATTUNG BEIM ANTASTEN VON EBENEN UND V-NUTEN MIT STAHLKUGELN]
Frank Luedicke Jan. 1982 107 p refs In GERMAN
(PTB-Me-34; ISSN-0341-6720) Avail: NTIS HC A06/MF A01

The flattening process during the touching of flat and V-grooves with steel balls, for a transition of the touching force from zero to 1 N was studied by a lateral measuring device. The validity of Hertz' theory was shown for all pairings of polished surfaces. Equations were developed to calculate the flattening of polished V-grooves in the symmetrical case. The measuring results on raw flat and V-grooves depend in the same way on the flank angle as on polished surfaces. Empirical equations which describe the flattening coefficient were developed to transfer the present measuring results to corresponding touching processes in the length measuring technique. It is found that in spite of different plastic deformations, the hardness of previously untouched specimens does not influence on the amount of flattening.
Author (ESA)

N82-31703# Stanford Univ., Calif. Guidance and Control Lab.
CLOSED LOOP CONTROL OF AUTOMOTIVE ENGINES Final Report, Feb. 1978 - Jun. 1980
J. David Powell, K. Randall, R. Hosey, and J. D. Powell Washington DOT Dec. 1981 316 p refs
(Contract DOT-TSC-1466)
(PB82-164088; DOT-TSC-NHTSA-81-12; DOT-HS-805-874) Avail: NTIS HC A14/MF A01 CSCL 13F

The application of optimization theory to develop control laws for use in closed loop control strategies to minimize the effect of fuel/air ratio and spark advance variables in internal combustion engines is considered. The automated dynamometer facility developed for the acquisition of engine mapping data is described. This data was used to develop analytical functions describing the fuel consumption and emissions at each of 10 torque/RPM points. The functions were used by an optimization procedure to arrive at control strategies and driving cycle predictions of fuel consumption and emissions. The optimum schedules were then used to determine a closed loop control strategy. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

No abstracts in this category.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N82-31704 National Gas Turbine Establishment, Pyestock (England).

THE DETECTION AND MEASUREMENT OF NON-THROUGH CRACKS USING THE ac POTENTIAL DIFFERENCE METHOD

E. C. Atkinson and M. E. F. Smith Mar. 1982 38 p refs
(NGTE-M81001; BR82989) Copyright. Avail: Issuing Activity

The application of an automated ac potential difference method to the detection and monitoring of non-through cracks in notch bend specimens subjected to cyclic loading is described. Techniques for calculating crack depths and growth rates from the output trace are outlined. The calculation method is shown to be different for nonmagnetic and magnetic material. A comparison of crack growth rates obtained using both this technique and striation counting for titanium alloys and mild steel shows close agreement over the range of crack depths where striations are resolvable. Author (ESA)

N82-31705 Politecnico di Milano (Italy). Dept. di Ingegneria Aerospaziale.

EXPERIMENTAL INVESTIGATION OF AEROELASTIC INSTABILITY OF OPEN FIELD THIN PROFILES [INDAGINE SPERIMENTALE SUL'INSTABILITA AEROELASTICA DI PROFILI SOTTILI APERTI]

G. Casarico (Soc. Anonima Elettrificazione SPA), S. DePonte, and P. Faggiano (Soc. Anonima Elettrificazione SPA) 1981 11 p In ITALIAN Presented at Coll. dei Tec. dell'Acciaio (CTA) Giornate Ital. della Costruzione in Acciaio, Palerma, Italy, Oct. 1981
Avail: Issuing Activity

The behavior of thin wall metal profiles under oscillating aerodynamic loads was investigated in a wind tunnel. The beams were held by elastic constraint, being able to move in all directions, while the air incidence angle was varied throughout the experiments. Three types of transient response characterized by one or two critical wind velocities and either flexional or torsional vibration, which are related to the profile characteristics and the wind incidence, are described. Author (ESA)

N82-31706*# Lehigh Univ., Bethlehem, Pa.

THE CRACK PROBLEM FOR A NONHOMOGENEOUS PLANE

F. Delale (Drexel Univ., Philadelphia, Pa.) and F. Erdogan Jun. 1982 22 p refs
(Grants NGR-39-007-011; NSF CME-78-09737)
(NASA-CR-169276; NAS 1.26:169276) Avail: NTIS HC A02/MF A01 CSCL 20K

The plane elasticity problem for a nonhomogeneous medium containing a crack is considered. It is assumed that the Poisson's ratio of the medium is constant and the Young's modulus E varies exponentially with the coordinate parallel to the crack. First the half plane problem is formulated and the solution is given for arbitrary tractions along the boundary. Then the integral equation for the crack problem is derived. It is shown that the integral equation having the derivative of the crack surface displacement as the density function has a simple Cauchy type kernel. Hence, its solution and the stresses around the crack tips have the conventional square root singularity. The solution is given for various loading conditions. The results show that the effect of the Poisson's ratio and consequently that of the thickness constraint on the stress intensity factors are rather negligible. Author

N82-31707*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE DISPLACEMENTS AND STABILITY ANALYSIS OF NONLINEAR PROPELLER STRUCTURES

Robert A. Aiello 1982 18 p refs Presented at the 10th NASTRAN User's Colloq., New Orleans, 13-14 May 1982
(NASA-TM-82850; NAS 1.15:82850) Avail: NTIS HC A02/MF A01 CSCL 20K

The use of linear rigid formats in COSMIC NASTRAN without DMAP procedures for the analysis of nonlinear propeller structures is described. Approaches for updating geometry and applying follower forces for incremental loading are demonstrated. Comparisons are made with COSMIC NASTRAN rigid formats and other independent finite element programs. Specifically, the comparisons include results from the four approaches for updating the geometry using RIGID FORMAT 1, RIGID FORMATS 4 and 13, MARC and MSC/NASTRAN. It is shown that 'user friendly' updating approaches (without DMAPS) can be used to predict the large displacements and instability of these nonlinear structures. These user friendly approaches can be easily implemented by the user and predict conservative results. Author

N82-31708*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TENSILE BUCKLING OF ADVANCED TURBOPROPS

C. C. Chamis and R. A. Aiello 1982 25 p refs Presented at the 23rd Struct., Struct. Dyn. and Mater. Conf., New Orleans, 10-12 May 1982; sponsored by AIAA, ASME, ASCE and AHS
(NASA-TM-82896; E-1276; NAS 1.15:82896) Avail: NTIS HC A02/MF A01 CSCL 20K

Theoretical studies were conducted to determine analytically the tensile buckling of advanced propeller blades (turboprops) in centrifugal fields, as well as the effects of tensile buckling on other types of structural behavior, such as resonant frequencies and flutter. Theoretical studies were also conducted to establish the advantages of using high performance composite turboprops as compared to titanium. Results show that the vibration frequencies are not affected appreciably prior to 80 percent of the tensile speed. Some frequencies approach zero as the tensile buckling speed is approached. Composites provide a substantial advantage over titanium on a buckling speed to weight basis. Vibration modes change as the rotor speed is increased and substantial geometric coupling is present. R.J.F.

N82-31709# National Physical Lab., Teddington (England). Div. of Materials Applications.

DEFLECTION AND STRESS ANALYSIS OF ANISOTROPIC PLATES IN FLEXURE

A. F. Johnson and A. Woolf Apr. 1982 26 p refs
(NPL-DMA(A)-41) Copyright. Avail: NTIS HC A03/MF A01

A finite difference method for computing deflections and stresses in rectangular anisotropic plates subjected to transverse flexural loading is outlined. The plate material is elastic and orthotropic with symmetry axes parallel to the plate edges, and plate deflections are assumed to be small. The method is illustrated using simply supported and clamped square plates under uniform pressure and point loads. The effect of material anisotropy on plate behavior is discussed. It is also found that the numerical techniques are efficient and simple enough to be implemented on a desk top minicomputer. Author (ESA)

N82-31710# Army Natick Research and Development Command, Mass.

MATHEMATICAL MODELING OF THE BIAXIAL STRESS-STRAIN BEHAVIOR OF FABRICS

Earl C. Steeves Mar. 1982 44 p
(DA Proj. 1T1-61101-91-A0)
(AD-A115058; NATICK/TR-82/009) Avail: NTIS HC A03/MF A01 CSCL 11/5

The development and increased use of computational structural design programs for fabric structures such as tents demands a description of the fabric stress-strain behavior in a form suitable for use on the computer. Some work is described on the development of mathematical models to fill that need. The technique used is nonlinear least squares fitting of experimental data to chosen functions which treat the biaxial strain as the dependent variables and the biaxial stresses as the independent variables. The experimental results used are from biaxial stress tests in which the ratio of the stresses in the two orthogonal

directions is maintained as a constant. Five sets of data, in each of which this constant has a different value, are used in the least squares problem. The results show a satisfactory fitting of the data from one fabric with stress-strain behavior that is typical of fabrics used in tentage. These results were obtained with three different power law functions of varying complexity. The most suitable of these functions depends on the particular use to be made of the results. Author (GRA)

N82-31711# Western Instruments Corp., Oxnard, Calif.
A COMPENDIUM OF TENSION MEMBER PROPERTIES FOR INPUT TO CABLE STRUCTURE ANALYSIS PROGRAMS Final Report, Nov. 1980 - Nov. 1981
Joseph F. Wadsworth, III Port Hueneme, Calif. Naval Civil Engineering Lab. Apr. 1982 70 p
(Contract N68305-80-C-0004; FY59556091)
(AD-A115019; NCEL-CR-82.017) Avail: NTIS HC A04/MF A01 CSCL 13/13

This report is a collection and condensation of cable properties used in computer simulations of cable dynamics problems. Data were taken from a variety of sources, and includes weight per foot (in air and immersed), elastic modulus, breaking strength, cross-sectional area, and drag and added mass coefficients. Cable types include chain, wire rope, synthetic and electromechanical. Author (GRA)

N82-31712# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
THE COMBINED EFFECTS OF MEAN STRESS AND AGGRESSIVE ENVIRONMENTS ON FATIGUE CRACK GROWTH Final Technical Report
J. A. Kapp May 1982 27 p refs Presented at the Joint JSME-SESA Conf. on Exper. Mech., Honolulu, 23-30 May 1982 Submitted for publication
(DA Proj. 1L1-61101-9A)
(AD-A116562; ARLCB-TR-82012) Avail: NTIS HC A03/MF A01 CSCL 11/6

Experiments have been performed to study the combined effects of aggressive environment and mean stress on fatigue crack growth. Since mean stress changes also change the stress ratio, R(R = sigma min/sigma max), experiments were performed to measure fatigue crack growth rates for various values of constant R. The experimental results were approximated mathematically using a modified superposition model. The results show that for negative values of R, the modified superposition model yields excellent agreement with the experiments. When R was positive, the mathematical model significantly overestimated the experimental results, suggesting that the full environmental effect condition cannot be achieved in the embrittling system chosen. GRA

N82-31713# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
SERVICE SIMULATION TESTS TO DETERMINE THE FATIGUE LIFE OF OD NOTCHED THICK WALL CYLINDERS Final Report
J. A. Kapp and J. H. Underwood Apr. 1982 32 p refs
(AD-A116452; ARLCB-TR-82008) Avail: NTIS HC A03/MF A01 CSCL 20/11

Simulation specimens were used to model the fatigue behavior of an OD notched internally pressurized cylinders of alloy steel. Results from continuum mechanics and finite element analyses are described for use in selection of simulation test conditions. The effects of notch depth and residual stress on fatigue life are determined from the simulation tests. Author (GRA)

N82-31714# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
STRESS INTENSITY FACTORS FOR RADIAL CRACKS AT OUTER SURFACE OF A PARTIALLY AUTOFRETTAGED CYLINDER SUBJECTED TO INTERNAL PRESSURE Final Report
S. L. Pu May 1982 50 p refs
(DA Proj. 1L1-61102-AH-60)
(AD-A116396; ARLCB-TR-82003) Avail: NTIS HC A03/MF A01 CSCL 12/1

The functional stress intensity factor approach which combines the finite element, thermal simulation and weight function methods developed for the computation of stress intensity factors for multiple radial cracks at the inner surface of a partially autofrettaged cylinder is applied in this report to external cracks. Numerical results of stress intensity factors are obtained for a cylinder with outer diameter twice the inner diameter. A slight increase into the degree of autofrettage will increase stress intensity factors of inner cracks slightly but will decrease stress intensity factors of external cracks considerably. As in the inner crack case, the cylinder with two diametrically opposed external cracks is in general the weakest configuration and for more than two cracks, the stress intensity factor decreases as the number of external cracks increase. Author (GRA)

N82-31715# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
FRACTURE ANALYSIS OF THICK-WALL CYLINDER PRESSURE VESSELS
J. H. Underwood and D. P. Kendall Apr. 1982 40 p refs Presented at the ASTM E-24 Comm. on Fracture, Philadelphia, 27-29 Apr. 1982
(DA Proj. 1L1-61101-A-98)
(AD-A116286; AD-E440143) Avail: NTIS HC A03/MF A01 CSCL 13/4

Fracture mechanics analysis of cylindrical pressure vessels is described in a brief fracture case study. Also included in this report are additional examples of crack growth in pressure vessels and cannons. The case study is of an early brittle failure and subsequent redesign of a cannon tube. Fracture mechanics test methods are described which were developed specifically for testing of cylindrical geometries. Three examples of current fracture analysis of cylindrical pressure vessels are presented. Fast fracture of a vessel is described, including effects of tension residual stress and crack shape. Evidence of environmentally assisted fracture of a cannon tube is presented. Fatigue crack growth and life calculation methods for cylindrical pressure vessels are developed and checked with experimental results; effects of compressive residual stress due to overstrain are analyzed, including reductions from the expected theoretical residual stress due to reduced compressive strength of the alloy steel. GRA

N82-31716# Michigan State Univ., East Lansing. Div. of Engineering Research.
THREE-DIMENSIONAL NATURE OF STRAIN FIELD NEAR COLDWORKED HOLES Final Report, Jun. 1978 - Feb. 1980
Gary Cloud and Somnuek Paleebut Wright-Patterson AFB, Ohio AFWAL May 1982 75 p refs
(Contract F33615-78-C-5123; AF Proj. 2418)
(AD-A116454; AFWAL-TR-80-4204) Avail: NTIS HC A04/MF A01 CSCL 13/5

As part of a comprehensive program to develop understanding of fatigue-rated fasteners, the three-dimensional aspects of the radial, hoop, and transverse strains which are created by drawing a tapered mandrel through a cylindrical hole were measured. A unique 3-dimensional moire procedure was used. Specimens were fabricated with multiple embedded grids. These grids were photographed for each specimen state. Moire fringe photographs were extracted from the replicas by coherent optical processing. Digital analysis of the fringes gave the desired strain maps. The residual radial strain after coldwork inside the specimen was found to be smaller than on the surface. The transverse strain changes from tension near the top surface where the mandrel enters to maximum compression at the midplane, where it begins to decrease. The hoop strain is maximum on the entry surface and decreases to a minimum at the midplane. The change in this component is only about four percent of the maximum value. Potential problems in the use of such coldworking processes might arise from the low value of the interior radial strain in comparison with the surface value and the existence of tensile transverse normal strain near the surface. Author (GRA)

N82-31717# Northrop Corp., Hawthorne, Calif. Aircraft Div.
METHODOLOGY FOR EVALUATION OF FATIGUE CRACK GROWTH RESISTANCE OF ALUMINUM ALLOYS UNDER SPECTRUM LOADING Final Technical Report, 4 Aug. 1980 - 4 Aug. 1981
G. R. Chanani, I. Telesman, P. E. Bretz, and G. V. Scarich Apr. 1982 148 p refs
(AD-A116500; NOR-82-54) Avail: NTIS HC A07/MF A01 CSCL 11/6

The purpose of this program is to obtain guidelines and test methodologies for selection and development of spectrum resistant, higher strength aluminum alloys for application to aircraft structures. The results described in this report present baseline characteristics of a number of high strength aluminum alloys for use in the future phases of this investigation. Seven commercial 2XXX and 7XXX aluminum alloys were chosen and have been characterized with respect to chemical composition, microstructure, tensile properties and fracture toughness. Fatigue crack propagation (FCP) tests were conducted on specimens of each alloy for both constant-amplitude loading (including the near-threshold region) and two F-18k load spectra. One of the spectra was dominated by tension loads and the other contained tension and compression loads of nearly equal magnitude. The spectrum FCP testing was performed at maximum peak stress of 145 MPa (21 ksi) as well as limited testing at 103 and 169 MPa (15 and 24.5 ksi) to obtain additional data at the low and high end of the crack-growth range. Pertinent fracture surface features were documented on the spectrum fatigue specimens. GRA

N82-31718# Riso National Lab., Roskilde (Denmark).
AERODYNAMIC FORCES ACTING ON THE BLADES OF STALL REGULATED PROPELLER TYPE WINDMILLS
F. Rasmussen Aug. 1981 37 p refs In DANISH
(DE82-901178; RISO-M-2316) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries; also available from Risoe Library, DK-4000, Roskilde, Denmark

Aerodynamic forces acting on the blades of stall regulated propeller type windmills are discussed. The expected dynamic behavior of the loads are outlined. Great dynamic loads under stall condition and skew wind (yaw or tilt) are shown by theoretical calculations from the blade element theory for one typical design. The forces on the three blades are calculated as well as the total forces from the rotor acting on the main shaft. Blade strut forces on a 10 m diameter, three blades Riisager windmill are measured. DOE

N82-31719# Sandia Labs., Albuquerque, N. Mex. Dept. of Nuclear Materials Transportation Technology.
ANALYSIS OF A SYSTEM FOR THE MEASUREMENT OF IMPACT LOADS
Mathias J. Sagartz and Robert M. Jefferson, ed. Jan. 1982 26 p refs
(Contract DE-AC04-76DP-00789)
(DE82-011695; SAND-81-0155A) Avail: NTIS HC A03/MF A01

A reinforced flat plate supported on load cell force transducers is proposed as a system for measuring the dynamic force of an impact test. The system is mathematically modeled as a beam on elastic supports loaded at its midspan by a half sine pulse. Analytical expressions are derived for the force vs time in the load cells and are shown to be functions of three parameters, the ratio of the load duration to the fundamental frequency of the system, the ratio of support stiffness to beam flexural stiffness and the ratio of the distance between supports to the total beam span. The results of calculations made for a range of parameters are presented and discussed. It is shown that the load cells should not be located at the end of the beam. Optimum results are obtained by placing them directly under what would be the nodal points of the fundamental beam vibration mode if the beam were in a free-free condition. As an example, a hypothetical impact testing including estimates for peak force and duration is considered and a drop table suitable for the test is designed. DOE

N82-31720# Sandia Labs., Albuquerque, N. Mex.
MECHANICAL PROPERTIES OF ANHYDRITE AND POLYHALITE IN QUASI-STATIC TRIAXIAL COMPRESSION
L. W. Teufel Oct. 1981 33 p refs
(Contract DE-AC04-76DP-00789)
(DE82-003195; SAND-81-0858) Avail: NTIS HC A03/MF A01

Bedded salt of the Salado Formation at the WIPP site in southeastern New Mexico is considered as a nuclear waste containment media. The Salado Formation is composed of 85 to 90 percent rock salt and the remaining 10 to 15 percent of the formation consists primarily of polycrystalline anhydrite, smaller amounts of polycrystalline polyhalite, and minor amounts of clay. In order to provide a more complete evaluation of the thermomechanical behavior of rock in the Salado Formation adjacent to the proposed repository, a rock mechanics testing program was initiated to determine the mechanical properties of the two most abundant nonsalt rock, anhydrite and polyhalite. The mechanical properties of these two rock types in dry, room temperature, quasistatic triaxial compression experiments to 20 MPa confining pressure is summarized. In addition, Coulomb-Mohr and Mises-Drucker criteria were pitted successfully to both yield and failure stress data. DOE

N82-31721# Los Alamos Scientific Lab., N. Mex.
CALCULATION OF SCATTERING OF ELASTIC WAVES FROM FLAT CRACKS
William M. Visscher 1981 7 p refs Proc. of AF/DARPA Rev. of Progr. in Quantitative NDE, Boulder, Colo., Aug. 1981
(Contract W-7405-eng-36)
(DE82-002624; LA-UR-81-3265; CONF-810839-4) Avail: NTIS HC A02/MF A01

A method, based on a boundary-integral representation of the elastic displacement, for calculating crack-opening-displacements on a flat crack of arbitrary shape and for incident elastic waves of arbitrary direction, polarization, and wavelength is developed and illustrated by application to Rayleigh scattering from two families of crack shapes. The crack-opening-displacement is expanded in a truncated complete set of functions on the crack surface. This transforms the boundary-integral representation into a matrix equation with rank three times the order of the truncation. This matrix equation has the properties that can be expressed as the result of an extremum principle with respect to variations of the expansion coefficients of the crack-opening-displacement (thus converges as the truncation order increases) and the matrix kernel (which must be inverted) is positive definite. DOE

N82-31722# Hanford Engineering Development Lab., Richland, Wash.
IN SITU FATIGUE-CRACK-PROPAGATION EXPERIMENT
A. M. Ermi and B. A. Chin 27 Aug. 1981 6 p refs Presented at the 2nd Topical Meeting on Fusion Reactor Mater., Seattle, 9-12 Aug. 1981
(Contract DE-AC14-76FF-02170)
(DE82-000979; HEDL-SA-2346-FP; CONF-810831-64) Avail: NTIS HC A02/MF A01

The effects of dynamic irradiation on fatigue crack propagation were determined. Eight 20% cold worked 316 stainless steel specimens were precracked to various initial crack lengths, linked together to form a chain, and inserted into a specially designed in reactor fatigue machine. Test conditions included a maximum temperature of 460 C, an environment of sodium, a frequency of 1 cycle/min, and a stress ratio of 0.10. It is indicated that: (1) no effects of dynamic irradiation are observed for a fluence of 1.5 x 10 to the 21 power n square cm; and (2) crack growth rates in elevated temperature sodium are a factor of 3 to 4 lower than in room temperature air. GRA

N82-31723# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
FRACTURE OF REFRACTORY CONCRETES, VOLUME 2 Ph.D. Thesis
Taghi Darroudi Mar. 1982 381 p refs
(Contract DE-AS01-77ET-10588)
(DE82-011543; DOE/ET-10588/T1-Vol-2) Avail: NTIS HC A17/MF A01

The mechanical properties, fracture characteristics, and the thermal shock damage behavior of a series of dense and lightweight refractory concretes were studied. The properties were correlated with observed phase changes and bonding characteristics over the temperature range from room temperature to 13500 C. It was observed that the properties of refractory concretes are controlled by the individual and collective properties of the aggregate and cement. The more refractory concretes were stronger at higher temperatures, especially above 8000 C. DOE

N82-31724# Washington Univ., St. Louis, Mo. Center for Computational Mechanics.
STRESS APPROXIMATIONS BY THE h AND p VERSIONS OF THE FINITE ELEMENT METHOD Final Report
B. A. Szabo and Ivo Babuska (Maryland Univ.) Mar. 1982 29 p refs Presented at 6th Invitational Symp. on the Unification of Finite Elements, Finite Differences and Calculus of Variations, Storrs, Conn., 7 May 1982
(Contracts N00014-81-K-0625; N00014-77-C-0623)
(AD-A116734; WU/CCM-82-1) Avail: NTIS HC A03/MF A01 CSCL 20/11

The computational effort required for achieving a given level of precision in the root-mean-square measure of stress is examined. The main conclusion is that for most problems of practical importance it is not feasible to exercise substantive control of error in this norm by means of state of the art finite element technology. The computation and control of error of stress intensity factors is a much simpler problem. Author (GRA)

N82-31725# Oxford Univ. (England). Dept. of Engineering Science.
ON THE BEHAVIOUR OF OPEN TOPPED OIL STORAGE TANKS IN HIGH WIND
R. J. Holyroyd Apr. 1982 140 p refs
(OUEL-1405/82) Avail: NTIS HC A07/MF A01

Measurements of the wind induced pressure loading on a scale model of a storage tank are reported for empty and full tank. For the empty tank it is shown that the mean component of the wind load induces deflections of the shell smaller than its minimum plate thickness. Mean wind load alone is insufficient to cause catastrophic collapse of the tank although the position of maximum deflection might act as a trigger for a mode of failure comprising a (part) circumferential band of wrinkles below the rim. For the full tank, it is shown that the tilt of the roof due to the mean component of the wind load is insufficient to cause it to buckle. From an analysis of an idealized mathematical model of the roof, expressions are derived for its natural frequencies and other modal parameters. Author (ESA)

N82-31726# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A DYNAMIC IDENTIFICATION METHOD FOR COMPLEX STRUCTURES Ph.D. Thesis - Conservatoire National des Arts et Metiers, Paris
Leon Barthe-Batsalle 1982 44 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-780)
(ONERA-NT-1982-3; ISSN-0078-3781) Avail: NTIS HC A03/MF A01

A global identification method for complex structures was developed to improve the finite element computation model for the study of harmonic vibrations based on measured natural modes. Modes are introduced as displacements imposed on a part of the structure in a static problem involving rigidity and mass operators. The method consists of seeking the unknown parameters which minimize the Euclidian norm of the reaction forces corresponding to the prescribed measured displacements. When numerous measured points are spread on the structure, it is possible to localize the modeling errors. Numerical results for a plate and an axisymmetric composite structure demonstrate the validity of this method. Author (ESA)

42 GEOSCIENCES (GENERAL)

N82-31727*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MOUNT ST. HELENS AEROSOL EVOLUTION
V. R. Oberbeck, N. H. Farlow, W. Fong (Information Management International, Palo Alto, Calif.), K. G. Snetsinger, G. V. Ferry, and D. M. Hayes (Environmental Analysis Labs. Corp., Richmond, Calif.) Aug. 1982 15 p refs
(NASA-TM-84265; A-8981; NAS 1.15:84265) Avail: NTIS HC A02/MF A01 CSCL 08K

Stratospheric aerosol samples were collected using a wire impactor during the year following the eruption of Mount St. Helens. Analysis of samples shows that aerosol volume increased for 6 months due to gas-to-particle conversion and then decreased to background levels in the following 6 months. Author

N82-31728*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SHUTTLE ACTIVE-MICROWAVE EXPERIMENTS (SAMEX) PROGRAM Executive Summary Report
Charles Elachi, ed. 1 Jul. 1982 16 p refs
(Contract NAS7-100)
(NASA-CR-169285; JPL-Pub-82-59; NAS 1.26:169285) Avail: NTIS HC A02/MF A01 CSCL 22A

The Shuttle active microwave experiments (SAMEX) program is reviewed. The key implementation aspects are presented. S.L.

N82-31729*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIREX MISSION REQUIREMENTS DOCUMENT FOR RENEWABLE RESOURCES
F. Carsey and T. Dixon 15 Jun. 1982 175 p refs
(Contract NAS7-100)
(NASA-CR-169288; JPL-Pub-82-47; NAS 1.26:169288) Avail: NTIS HC A08/MF A01 CSCL 22A

The initial experimental program and mission requirements for a satellite synthetic aperture radar (SAR) system FIREX (Free-Flying Imaging Radar Experiment) for renewable resources is described. The spacecraft SAR is a C-band and L-band VV polarized system operating at two angles of incidence which is designated as a research instrument for crop identification, crop canopy condition assessments, soil moisture condition estimation, forestry type and condition assessments, snow water equivalent and snow wetness assessments, wetland and coastal land type identification and mapping, flood extent mapping, and assessment of drainage characteristics of watersheds for water resources applications. Specific mission design issues such as the preferred incidence angles for vegetation canopy measurements and the utility of a dual frequency (L and C-band) or dual polarization system as compared to the baseline system are addressed. E.A.K.

N82-31730*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIREX MISSION REQUIREMENTS DOCUMENT FOR NONRENEWABLE RESOURCES
T. Dixon and F. Carsey 15 Jun. 1982 89 p refs
(Contract NAS7-100)
(NASA-CR-169289; JPL-Pub-82-46; NAS 1.26:169289) Avail: NTIS HC A05/MF A01 CSCL 22A

The proposed mission requirements and a proposed experimental program for satellite synthetic aperture radar (SAR) system named FIREX (Free-Flying Imaging Radar Experiment) for nonrenewable resources is described. The recommended spacecraft minimum SAR system is a C-band imager operating in four modes: (1) low look angle HH-polarized; (2) intermediate look angle, HH-polarized; (3) intermediate look angle, HV-polarized; and (4) high look angle HH-polarized. This SAR system is complementary to other future spaceborne imagers such as the Thematic Mapper on LANDSAT-D. A near term aircraft SAR based research program is outlined which addresses specific mission

design issues such as preferred incidence angles or polarizations for geologic targets of interest. E.A.K.

N82-31731# International Geophysical Year World Data Center A, Boulder, Colo. Glaciology (Snow and Ice).
SNOW WATCH 1980
George Kukla, ed. (Lamont-Doherty Geological Observatory), A. Hecht, ed. (NSF), and D. Wiesnet, ed. (NOAA, Washington, D.C.) Oct. 1981 143 p refs Workshop held in Washington, D.C., 1-2 Oct. 1980
(PB82-169301; NOAA-81123002; GD-11) Avail: NTIS HC A07/MF A01 CSCL 08L

The impact of seasonal snow fields, deposited on land or sea ice, on climate and climate modeling is addressed. In addition the content and accuracy of snow and ice cover charts and the digital products and indices related to snow and ice are discussed. For individual titles, see N82-31732 through N82-31749.

N82-31732# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SNOW IN CLIMATE DIAGNOSIS AND MODELING, INTRODUCTION **c47**
George Kukla, ed., A. Hecht, ed., and D. Wiesnet, ed. *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 11-12 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The question of whether snow cover is a passive product of a particular circulation pattern, or does weather develop in response to the distribution of snow on the ground is introduced. According to climate models, snow and ice fields are highly sensitive elements of the Sun-Earth-atmosphere system. It is also generally recognized that snow and ice covers have a profound impact on microclimate and weather on a synoptic scale. Evidence is accumulating on an anomalously deep snow cover in Tibet being followed by an anomalously late onset of the Indian monsoon. Still, in short-term weather forecasting, the snow cover distribution is seldom taken into account. M.G.

N82-31733# Scripps Institution of Oceanography, La Jolla, Calif.
SNOW COVERS IN CLIMATE AND LONG-RANGE FORECASTING **c47**
Jerome Namias *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 13-26 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

An attempt was made to investigate the snow characteristics of winters in the northeastern United States. Two primary sources of data were used: (1) snowfall totals for many stations in the northeastern United States from 1932 through 1959; and (2) seasonally averaged or mean maps at the 700 mb (about 10,0000 foot) level. The relation between snow cover and blocking was examined. It is concluded that snow cover variations are important for diagnosis and forecasting on monthly, seasonal, and interannual time scales. The variable extent of snow cover fields affects advancing polar air masses and introduces variable horizontal temperature gradients, which in turn may influence cyclogenesis and also may reinforce blocking. As a result, weather and climate patterns are modified considerably on both local and continental scales. M.G.

N82-31734# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SNOW COVERS AND CLIMATE **c47**
George Kukla *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 27-39 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

It is noted that high reflectivity, high emissivity, low water vapor pressure, and low conductivity make snow an important element of the climate system whose formation and dissipation closely depends on the amount and angular distribution of incoming radiation. Each of these characteristics of snow cover are described and mechanisms involved in the dissipation of snow are discussed. The influence of snow cover on synoptic weather and the climate of middle latitudes is addressed and the effects of atmospheric turbidity and carbon dioxide on snow cover are examined. Several snow related feedback are defined including snow-albedo-temperature feedback, snow-high pressure cells-polar outbreaks, snowmelt-evaporation-Arctic stratus, and snowline elevation feedback. M.G.

N82-31735# Maryland Univ., College Park. Dept. of Meteorology.
THE USE OF SNOW AND ICE IN ENERGY BALANCE CLIMATE MODELING **c47**
Alan Robock *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 41-43 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

Snow and ice data as well as satellite derived measurements of the planetary radiative balance were used to develop parameterizations of the effects of snow and ice on the planetary albedo. The findings were then applied to a seasonal climate model and the consequent decrease in model sensitivity is discussed. M.G.

N82-31736# National Oceanic and Atmospheric Administration, Princeton, N. J. Geophysical Fluid Dynamics Lab.
SUMMARY REQUIREMENTS OF GCMS FOR OBSERVED SNOW AND ICE COVER DATA **c47**
Douglas G. Hahn *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 45-53 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

Figures which include examples of how satellite derived data sets can be used to validate climate general circulation model (GCM) results are discussed. The model results displayed in the comparisons are those of a global spectral GCM with rhomboidal truncation at wave number 15. This model was time integrated for 15 model years. The seasonal evolution of computed (by the GCM) and observed monthly mean snow cover is averaged over the Northern Hemisphere, over Eurasia, and North America. The model tends to overestimate snow cover in the winter seasons, and this is somewhat more serious over Eurasia than North America. The seasonal evolution of computed and observed standard deviation of monthly mean snow cover for the Northern Hemisphere is also shown. Observations indicate that the interannual variability of monthly mean snow cover is largest in the months of October and November over the Eurasian continents. This feature is not duplicated by the model. M.G.

N82-31737# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
NORTHERN HEMISPHERE SNOW AND ICE CHARTS OF NOAA/NESS **c47**
Frank Smigielski *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 59-62 (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The data sources and preparation of the National Earth Satellite Service weekly snow and ice boundary chart are described. This chart is prepared on a 1:50,000,000 polar-stereographic base map centered on the North Pole. The primary source of information is satellite imagery from the visible scanning radiometers of the National Oceanic and Atmospheric Administration polar orbiting satellite systems. Secondary input comes from the visible scanning radiometers of the Geostationary Satellite systems over the North American continent south of 60 N, and occasionally from the Defense Meteorological Satellite Program systems. The specifications of currently used satellite sensors are given. Photointerpretation categories and problem areas are defined. M.G.

N82-31738# Air Force Global Weather Central, Offutt AFB, Nebraska.
THE US AIR FORCE SNOW COVER CHARTS **c47**
Robert C. Woronicz *In* International Geophysical Year World Data

Center A Snow Watch 1980 Oct. 1981 p 63-70 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The snow cover analysis model, SNODEP, is described. It is run once daily at Air Force Global Weather Central to produce a gridded analysis of snow depth and age. The grid is superimposed on a polar-stereographic map projection so that the grid point spacing is about 25nm (46.3km) at 60 N and S. The model is global in scope, providing analyses in both the Northern and Southern Hemispheres. The data sources are described and an experiment to test the feasibility of using visible/near infrared satellite imagery to discriminate cloud covered from snow covered scenes is discussed. M.G.

N82-31739# National Oceanic and Atmospheric Administration, Washington, D. C. Basic Weather Branch.
SEA ICE CHARTS OF THE NAVY/NOAA JOINT ICE CENTER c48
Raymond H. Godin *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 71-78 (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The data sources and preparation procedures for the Navy/NOAA Joint Ice Center weekly Arctic and Antarctic ice analyses are described. The chart features include ice concentration, ages and stages, morphological descriptives, ice limits and boundaries, estimated limits, and seven-day limit forecasts. The advantages and disadvantages of satellite imagery at different spectral ranges are discussed. M.G.

N82-31740*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTARCTIC SEA ICE COVER FROM SATELLITE PASSIVE MICROWAVE c48
H. J. Zwally, J. Comiso, C. Parkinson, W. Campbell, F. Carsey, and P. Gloersen *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 79-86 (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The 3-day images from the Nimbus 5 electrically scanning microwave radiometer were combined to form monthly average maps and contour plots. These show clearly the yearly cycle from minimum ice extent in February to maximum ice extent from August to September and the spatial distribution of ice 15 to 50 percent concentrated, 50 to 85 percent concentrated, and 85 to 100 percent concentrated. The yearly cycle of the monthly extent of ice is plotted for each of the four years (1973-76). The total 4-year range in monthly mean concentrations (over the 30 km x 30 km grid elements with ice present) is 50 to 80 percent, and the yearly cycle is far less distinct than that for the ice areas. R.J.F.

N82-31741# Lamont-Doherty Geological Observatory, Palisades, N. Y.
LAMONT CLIMATIC SNOW COVER CHARTS c47
George Kukla, David Robinson, and J. Brown *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 87-92 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The recharting of a climatic series of snow cover charts is discussed. The objective is to increase the accuracy and homogeneity of the NOAA snow cover series from 1966 through 1973. For that interval, the NOAA weekly charts are considerably less accurate and less detailed than the more recent products. Most seriously affected is the information on the relative reflectivity and the position of snow cover in the zone of poor illumination in autumn. The early inaccuracy is due to the inferior quality of early satellite imagery and the relative inexperience of the NOAA interpreters at that time. The recharting is designed to present the information in a manner compatible with the current NOAA series. To that end, they indicate separately all snow cover visible on clear days. They are to be compatible with the recent U.S. Air Force charts. Therefore they indicate separately the snow cover under persistent clouds. They are designed to identify the charted information with a time resolution of two days or less. A numerical code is used which includes symbols specifying the date of the observation. They are also designed to improve the information on the relative snow cover reflectivity. R.J.F.

N82-31742# Atmospheric Environment Service, Downsview (Ontario).
SNOW AND ICE MAPPING IN CANADA c43
Barry Goodison *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 93-96 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The archiving and mapping of Canadian snow cover and sea ice data are reviewed. The processing of near real-time water budgets for approximately 225 synoptic stations across Canada is discussed. Future plans for ice data acquisition, ice forecasting, and ice climatology are given. Climate modeling needs are discussed. R.J.F.

N82-31743# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
STUDY OF THE SEA ICE DISTRIBUTION IN THE NORTH POLAR REGIONS c48
Ingrid Haupt *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 97-102 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

With regard to the important role of the polar regions in the general atmospheric circulation and to the interaction between atmosphere and surface, a systematic study was made to investigate the behavior of sea ice in the north polar regions in relation to the monthly pressure and temperature distribution for the period 1966 - 1979. R.J.F.

N82-31744# Lamont-Doherty Geological Observatory, Palisades, N. Y.
CLIMATIC VALUE OF OPERATIONAL SNOW AND ICE CHARTS c47
George Kukla and David Robinson *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 103-120 refs (For primary document see N82-31731 22-42) (Grants NSF ATM-77-28522; NSF ATM-80-01470)
Avail: NTIS HC A07/MF A01 CSCL 08L

Operational snow and ice cover charts produced by NOAA, the Navy and the U.S. Air Force Global Weather Central were compared with ground station reports and original satellite imagery. The objective was to find out how accurately snow presence and thickness, as well as the snow impact on surface albedo, are depicted in space and time. It was concluded that the information on snow line position is sufficiently accurate for use in the current generation of global circulation models in all seasons except autumn. However, the quality of the information on surface albedo, on the thickness of snow covers, and on the proportion of open water within the pack needs radical improvements. R.J.F.

N82-31745# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
DIGITIZATION OF THE NOAA/NESS CONTINENTAL SNOW COVER DATA BASE c82
Michael Matson and Marylin S. Varnadore *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 123-128 ref (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

The progress NOAA/NESS Northern Hemisphere continental snow cover data base is discussed. It is being incorporated more frequently into climate modeling and diagnostic studies. In an effort to facilitate this integration, NESS, in conjunction with the University of Nebraska-Lincoln, has undertaken the digitization of the continental snow cover data base from 1966-1980. The Northern Hemisphere Weekly Snow and Ice Cover Chart is being digitized using a NMC I, J box grid overlayed on a polar-stereographic map. The grid selected is the same as that used for the satellite-based earth radiation budget. After establishing the appropriate

geography into the data base each grid box is designated snow-covered if the grid box has 50 percent or more snow cover; non-snow covered if there is 50 percent or less snow cover. The reflectivity classes are not digitized. To enhance the display of snow cover on the computer printout, a microfilm product was developed which allows the snow-covered areas to be displayed on an appropriate background geography (see figure 4). Although not shown here, a color microfilm map was developed with water as blue, land as green, and snow as gold. Archival of the digitized continental snow cover data will not only be on microfilm, but also on punch cards and computer-compatible tape. B.W.

N82-31746# Nebraska Univ., Lincoln.
SNOW COVER DIGITAL PRODUCTS **c47**
Kenneth F. Dewey *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1961 p 129-134 ref (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

It is noted that there is a significant interaction between the extent of snow cover and synoptic-scale atmospheric conditions. One of the limiting factors in a study of this interaction has been the lack of digitized snow cover data. The Climatology Dept. at the University of Nebraska-Lincoln did a study which has resulted in the digitization of all Weekly Snow and Ice Charts back to 1966. Accepting the fact that detail and accuracy have probably improved through time, it is noted that this is the only complete record of Northern Hemisphere snow cover dating back to the 1960's. Therefore, a decision was made to retain all charts and to digitize the complete set. An I, J matrix overlay (based upon the NMC grid) was provided by NESS and utilized in the digitization of each of the snow and ice charts. Any individual grid box was indicated to be snow or ice covered if, through visual interpretation, at least 50 percent of the box was marked in the chart as covered by snow or ice. The format that the data are stored in is presented. The display of the digitized product is illustrated for the entire Northern Hemisphere. The data are stored by continent so it is possible to have, for example, just a display of Eurasia or North America. B.W.

N82-31747# Lamont-Doherty Geological Observatory, Palisades, N. Y.
MAXIMUM SNOW AREA DENSITY DIGITIAL PRODUCT **c43**
George Kukla and David Robinson *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 135-138 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

Maximum snow area density (SAD) of stable snow cover in six classes is shown for the Northern Hemisphere. Data are available in digitzed form in the NMC grid. Author

N82-31748# Illinois Univ., Urbana.
SNOW AND ICE DATA SETS **c43**
John E. Walsh *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 139-144 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

Data sets describing the variability of sea ice are presented. Sea ice data sets are pertinent to the study of snow cover to the extent that sea ice serves as a platform for snow cover over the oceans. Aside from its association with snow cover, sea ice is a potentially important climatic variable in its own right. Three types of data sets are distinguished: (1) regional data sets and indices describing ice variability over the synoptic scale; (2) hemispheric or global data sets in which there is some information pertinent to sea ice, but in which ice variability is not the major concern; and (3) hemispheric/global ice data sets directed specifically at sea ice variability. The last two categories should generally be most appropriate for large-scale climatic studies. B.W.

N82-31749# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SNOW AND ICE INDICES **c47**
George Kukla and Joyce Gavin *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 145-148 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

To investigate the impact of recent seasonal and interannual variation of snow and ice covers on the earth's heat budget, several indices are currently being generated on a weekly basis. These represent: (1) the area covered by snow or ice - S; (2) the percent of open water within the pack-ice - W; (3) surface albedo estimates for varying conditons of snow and ice cover - a sub s; and (4) the energy absorbed by the surface under specified atmospheric conditions and solar angle - q. The primary data set consists of the areas of snow and ice classes as measured in each chart. An open water index, in percent, is calculated based on the proportion of open water within the pack-ice perimeter. The ice edge is delimited as having an average concentration of at least 1 okta. A time series of reflectivity indices a sub s (in percent) and of absorption index q (in Ly/day) are also produced. The former represents an estimate of total SW reflectivity in clear dry air and under a solar angle of 30 deg. Reflectivity is here understood as a property of the surface to reflect a specific portion of incoming radiation over the full short-wave range. In the computation of the a sub s index, all snow-free land north of 30N is considered to have a reflectivity of 17 percent. The absorption index is an estimate of the amount of short-wave radiation absorbed by the ground or ocean based on indices S and a sub s, with the ground level downward daily radiance total assumed to be equal to 0.4 of the insolation on the top of the atmosphere. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N82-31750# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF ORBITAL IMAGES AS AN ADEQUATE FORM OF CONTROL OF PRESERVED AREAS [UTILIZACAO DE IMAGENS ORBITAIS COMO FORMA ADEQUADA NO CONTROLE DE AREAS DE PRESERVACAO]
Joao Roberto dosSantos Mar. 1982 16 p refs In PORTUGUESE Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981 Submitted for publication Sponsored in part by the National Council for Scientific and Technical Development and the Brazilian Inst. for Forestry Development
(INPE-2064-RPE/306) Avail: NTIS HC A02/MF A01

The synoptic view and the repetitive acquisition of LANDSAT imagery provide precise information, in real time, for monitoring preserved areas based on spectral, temporal and spatial properties. The systematic annual burning, which causes the degradation of ecosystems in the National Park of Araguaia was monitored. LANDSAT imagery of channel 5 (0.6 to 0.7 microns) and 7 (0.8 to 1.1 microns), at the scale of 1:250.000, were used to identify and delimit vegetation units and burned area, based on photointerpretation parameter of tonality. The results show that the gallery forest can be discriminated from the seasonally flooded 'campo cerrado' and that 4,14% of the study areas was burned. It was concluded that LANDSAT images can be used for the implementation of environmental protection in National Parks. S.L.

N82-31751# Army Engineer Topographic Labs., Fort Belvoir, Va.
CLASSIFICATION OF CARTOGRAPHIC FEATURES THROUGH WALSH TRANSFORMS Research Note, Sep. 1979 - Dec. 1980
Pi-Fuay Chen, Frederick W. Rhode, and William W. Seemuller Apr. 1982 43 p
(DA Proj. 4A1-61102-B-52-C)
(AD-A116731; ETL-0290) Avail: NTIS HC A03/MF A01 CSCL 08/2

An algorithm was used to classify and recognize a set of selected cartographic features, such as road intersections, straight line roads, and rectangular objects, which were decomposed in the Walsh transform domain. The method was implemented digitally with an experimental system consisting of a solid state sensor array, a minicomputer as signal processor, and a computer controlled translational stage as the image holder. Recognition examples for the set of cartographic features with respect to the window of inspection are presented. Nearly 90% recognition accuracy was obtained for the selected set of the cartographic features. Author (GRA)

N82-31752# California Univ., Berkeley. Lawrence Berkeley Lab. National Geothermal Information Resource.
USER'S GUIDE TO THE GEOTHERMAL RESOURCE AREAS DATABASE
J. D. Lawrence, Keith Leung, and Winifred Yen Oct. 1981 66 p refs
(Contract W-7405-eng-48)
(DE82-011060; LBL-11492) Avail: NTIS HC A04/MF A01

A geothermal resource areas database called GRAD, designed to answer questions about the progress of geothermal energy development is discussed. This database will contain extensive information on geothermal energy resources for selected areas, covering development from initial exploratory surveys to plant construction and operation. The database is available for on-line interactive query by anyone with an account number on the computer, a computer terminal with an acoustic coupler, and a telephone. Some information is provided on obtaining access to the computer system being used, instructions on obtaining standard reports, and some aids to using the query language. DOE

N82-31753# ENSCO, Inc., Springfield, Va.
AUTOMATIC TRACKING OF COAL/SHALE BOUNDARIES WITH PULSE RADAR Final Report
31 Aug. 1981 68 p
(Contract DE-AC01-78ET-11067)
(DE82-007757; DOE/ET-11067/T1) Avail: NTIS HC A04/MF A01

Automatic tracking of coal/shale boundaries with pulse radar was studied. Existing radar equipment and a breadboard version of the processor in four mines in different areas of the country were tested. The ability of short pulse radar to locate the coal/shale boundary in the mine roof was verified. The design for a radar coal interface detector (CID) which could operate in roof coal thicknesses ranging from 2 inches to 24 inches was specified. The final system was unable to operate reliably in thin roof coal. This was due to the inability of the processor to separate the reflection from the surface return. A higher frequency transducer was tried, however, this unit was unable to penetrate the coal. It is concluded that the delivered system can be used in mines where the roof coal ranges from 9 inches to 24 inches thick. DOE

N82-31754# Ford, Bacon and Davis Utah, Inc., Salt Lake City.
ENGINEERING ASSESSMENT OF RADIOACTIVE SANDS AND RESIDUES, LOWMAN SITE, LOWMAN, IDAHO
Sep. 1981 142 p refs
(Contract DE-AC04-76GJ-01658)
(DE82-002008; DOE/UMT-0118; FBDU-360-70) Avail: NTIS HC A07/MF A01

The Lowman site was reevaluated in order to revise the December 1977 engineering assessment of the problems resulting from the existence of radioactive sands and residues at Lowman, Idaho. The assessment included the preparation of topographic maps, the performance of core drillings, and radiometric measurements sufficient to determine areas and volume of radioactive sands and residues and radiation exposure of individuals and nearby populations, and investigations of site hydrology and meteorology, and the evaluation and costing of alternative corrective actions. Radon gas released from the 191,000 tons of radioactive sands, residues, and contaminated soils at the Lowman site constitutes the most significant environmental impact, although windblown radioactive sands and external gamma radiation also are factors. DOE

N82-31755# Ford, Bacon and Davis Utah, Inc., Salt Lake City.
SUMMARY OF THE ENGINEERING ASSESSMENT OF RADIOACTIVE SANDS AND RESIDUES, LOWMAN SITE, LOWMAN, IDAHO
Sep. 1981 48 p refs
(Contract DE-AC04-76GJ-01658)
(DE82-002010; DOE/UMT-0118S; FBDU-360-17S) Avail: NTIS HC A03/MF A01

The Lowman site was reevaluated in order to revise the December 1977 engineering assessment of the problems resulting from the existence of radioactive sands and residues at Lowman, Idaho. This engineering assessment included the preparation of topographic maps, the performance of core drillings, and radiometric measurements sufficient to determine areas and volumes of radioactive sands and residues and radiation exposures of individuals and nearby populations, the investigations of site hydrology and meteorology, and the evaluation and costing of alternative corrective actions. Radon gas released from the 191,000 tons of radioactive sands, residues, and contaminated soils at the Lowman site constitutes the most significant environmental impact, although windblown radioactive sands and external gamma radiation also are factors. DOE

N82-31756# Occidental Research Corp., Irvine, Calif.
SHALE OIL: POTENTIAL FOR ELECTRIC POWER FUELS Final Report
M. Gragg, R. E. Lumpkin, H. D. Guthrie, and S. G. Woinsky Dec. 1981 99 p refs
(DE82-901906; EPRI-AP-2186) Avail: NTIS HC A05/MF A01

The status of the oil shale industry and the impact it will have on the electric power industry in the years 1990 to 2000 is reviewed. The major problem most processes face today is scale-up to commercial size. An industry of nearly 400,000 BPD is anticipated for 1990. The industry could grow to 1,000,000 BPD by the year 2000 with the introduction of second generation processes in the 1990s. As the refineries improve their ability to handle shale oil, the availability of this fuel to the electric power industry for direct firing will decrease. The offgas from the oil shale industry could be of major importance to the electric power industry. One-quarter to one-third of the energy produced by the oil shale industry will be in the form of offgas (the gas produced in the retorting process). This will usually be a low Btu gas and therefore likely to be utilized on site to make electricity. The high yield of distillate fuels from shale oil could be important to the utility industry's demand for distillate fuels in peak shaving power generation. DOE

N82-31757# Battelle Pacific Northwest Labs., Richland, Wash.
WESTERN OIL-SHALE DEVELOPMENT. A TECHNOLOGY ASSESSMENT. VOLUME 4: SOLID WASTE FROM MINING AND SURFACE RETORTS Final Report
Jan. 1982 69 p refs
(Contract DE-AC06-76RL-01830)
(DE82-010107; PNL-3830-Vol-4) Avail: NTIS HC A04/MF A01

Information on the disposal, composition, and leachability of solid wastes produced by aboveground shale oil extraction processes was reviewed. The relationship of development to surface and groundwater quality in the Piceance Creek basin of northwestern Colorado are examined. Key areas of research necessary to quantitative assessment of impact are identified. The following information is presented: proposed surface retorting developments; surface retorting processes; environmental concerns; chemical/mineralogical composition of raw and retorted oil shale; disposal procedures; water quality; and research needs. DOE

N82-31758# Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif. Energy Measurements Group.
AERIAL RADIOLOGICAL SURVEY OF THE VIRGIL C. SUMMER NUCLEAR STATION AND SURROUNDING AREA, JENKINSVILLE, SOUTH CAROLINA Survey Report, 9-16 Mar. 1981

Jul. 1981 13 p refs
(Contract DE-AC08-76NV-01183)
(DE82-001982; EGG-1183-1801) Avail: NTIS HC A02/MF A01

An aerial radiologic survey was performed from 9 to 16 March 1981 over a 280 square kilometer area centered on the Virgil C. Summer Nuclear Power Station near Jenkinsville, South Carolina. All gamma-photon data were collected by flying North-South lines spaced 230 meters apart at an altitude of 122 meters above ground level. Processed data showed that all gamma-phonons detected within the survey area were those expected from naturaly occurring terrestrial background emitters. Count rates obtained from the aerial platform were converted to exposure rates at 1 meter above the ground and are presented in the form of an isoradiation contour map. The observed exposure rates over the land areas were between 6 and 30 microroengtens per hour with most of the area ranging from 6 to 15. These values include an estimated cosmic ray contribution of 4.0 microroengtens per hour. The exposure rate obtained from soil samples taken at the survey site displayed positive agreement with the aerial data. DOE

N82-31759# Pacific Northwest Lab., Richland, Wash.
RESEARCH SUMMARY: CHARACTERIZATION OF RADIONUCLIDE AND MOISTURE MOVEMENT THROUGH ARID REGION SEDIMENTS
G. W. Gee, T. L. Jones, and D. Rai Sep. 1981 12 p refs
(Contract DE-AC06-76RL-01830)
(DE82-003840; PNL-SA-9887) Avail: NTIS HC A02/MF A01

The task of understanding the movement of moisture and radionuclides under arid region conditions is discussed. This understanding will be used to maximize the isolation of low level waste from the environment. Specific objectives include: field monitoring of moisture and radionuclide transport at an arid region site; assessment of the interaction of radionuclides with unsaturated soils in arid regions; evaluation of radionuclide transport in unsaturated soils by appropriate mathematical models; and assessment of the importance of upward migration of radionuclides by evaporation and diffusion processes. Author

N82-31760# Michigan Univ., Ann Arbor. School of Natural Resources.
VEGETATION CLASSIFICATION IN ARID ENVIRONMENTS: AN ALTERNATIVE APPROACH
D. L. Rebel 1982 6 p refs Presented at the 1st Thematic Conf. on Remote Sensing of Environ.: Remote Sensing of Arid and Semiarid Lands, Cairo, 19 Jan. 1982
(Contract DE-AC08-76NV-01183)
(DE82-010437; EGG-1183-1813; CONF-820110-1) Avail: NTIS HC A02/MF A01

In order to overcome the limitations of traditional classification techniques which rely heavily on vegetation greenness, an alternative approach to vegetation classification by remote sensing is presented. The approach was devised based on studies in the Southwestern United States over several years. It involves the assessment of a number of conditions, including whether the vegetation is green or not, whether the vegetation exists as part of a variable or monotypic community, whether the underlying soils are of variable or uniform albedo, and the extent of the topographic relief. Classification procedures to use for various combinations of these conditions are suggested. DOE

N82-31761# Research Inst. of National Defence, Linkoeping (Sweden).
AN IMAGE PROCESSING METHOD FOR POSITION ESTIMATION: A MAXIMUM LIKELIHOOD APPROACH
Dan Andree (Royal Inst. of Technology, Stockholm) and Aake Wernersson Apr. 1982 70 p refs
(FOA-C-30273-E1) Avail: NTIS HC A04/MF A01

A method which uses image information when updating a fully automated navigational system was studied. The method was tested using LANDSAT images. Well defined contours are found for each scan. Estimated contours are compared with prestored contours. The position estimate is the maximum likelihood estimate of the contour coordinates. For test data with a signal to noise ratio (SNR) of 3, a very distinct estimate is obtained. For SNR = 0.65 a correct, but less distinct, minimum is obtained, which can be improved by using the correlation properties of the image. Author (ESA)

N82-31762# Water Resources Council, Washington, D.C. State Grants Dept.
STATE OF THE STATES: WATER RESOURCES PLANNING AND MANAGEMENT, FISCAL YEAR 1981 UPDATE
Sep. 1981 124 p refs Prepared in cooperation with the National Council of State Legislatures, Denver, Colo.
(PB82-161753) Avail: NTIS HC A06/MF A01 CSCL 13B

The advent of a new, stronger State role in developing and implementing national water policy has acted as a catalyst for public awareness and acceptance of the urgent need to plan for wise use of water. In this process, a new generation of issues has arisen to confront decisionmakers in the 1980's. This deals with top priority water problems and provides assistance that will encourage new State and regional management strategies to deal with the nation's water problems. GRA

N82-31763# Camp, Dresser and McKee, Inc., Austin, Tex.
WATER RESOURCES REFERENCE BASE FOR THE 13A ASSESSMENT OF THE TEXAS PORTIONS OF THE TEXAS GULF REGION AND THE RED RIVER BASIN
Aug. 1981 172 p refs Sponsored in part by the Texas Dept. of Water Resources and the Water Resources Council
(PB82-163668) Avail: NTIS HC A08/MF A01 CSCL 13B

Water resource conditions, water availability and water utilization for the Texas Gulf Region are included. Projected and current water use for electric power production are also given. GRA

N82-31742# Atmospheric Environment Service, Downsview (Ontario).
SNOW AND ICE MAPPING IN CANADA
Barry Goodison *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 93-96 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31747# Lamont-Doherty Geological Observatory, Palisades, N. Y.
MAXIMUM SNOW AREA DENSITY DIGITIAL PRODUCT
George Kukla and David Robinson *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 135-138 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31748# Illinois Univ., Urbana.
SNOW AND ICE DATA SETS
John E. Walsh *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 139-144 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-31764* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH VOLTAGE PLANAR MULTIJUNCTION SOLAR CELL
Patent

John C. Evans, Jr., An-Ti Chai, and Chandra P. Goradia, inventors (to NASA) Issued 24 Dec. 1980 6 p Filed 24 Dec. 1980 Supersedes N81-16528 (19 - 07, p 0927)
(NASA-Case-LEW-13400-1; US-Patent-4,341,918; US-Patent-Appl-SN-219677; US-Patent-Class-136-249; US-Patent-Class-357-30) Avail: US Patent and Trademark Office CSCL 10A

A high voltage multijunction solar cell is provided wherein a plurality of discrete voltage generating regions or unit cells are formed in a single generally planar semiconductor body. The unit cells are comprised of doped regions of opposite conductivity type separated by a gap or undiffused region. Metal contacts connect adjacent cells together in series so that the output voltages of the individual cells are additive. In some embodiments, doped field regions separated by a overlie the unit cells but the cells may be formed in both faces of the wafer.

Official Gazette of the U.S. Patent and Trademark Office

N82-31765 International Institute for Applied Systems Analysis, Laxenburg (Austria).
A LONG-TERM MACROECONOMIC EQUILIBRIUM MODEL FOR THE EUROPEAN COMMUNITY Ph.D. Thesis - Karlsruhe Univ., West Germany
Hans-Holger Rogner Apr. 1982 91 p refs
(IIASA-RR-82-13; ISBN-3-7045-0035-6) Copyright. Avail: Issuing Activity

A version of MACRO, a highly aggregated, long-term, two-sector general equilibrium model, developed to examine energy-economy linkage, calibrated for the European community, is presented. Based on a range of energy supply scenarios, the impact of rising energy costs on economic activity, the feasibility of common assumptions about price-induced conservation, and the impact of continued high energy levels of energy imports on trade balance were examined, in order to assess model performance. Results suggest that the model meets the requirements for a consistency check of member country energy strategies.

Author (ESA)

N82-31766 International Institute for Applied Systems Analysis, Laxenburg (Austria).
EVOLUTION OF FUTURE ENERGY DEMANDS TILL 2030 IN DIFFERENT WORLD REGIONS: AN ASSESSMENT MADE FOR THE TWO INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS (IIASA) SCENARIOS
Arshad M. Khan and Alois Hoelzl Apr. 1982 140 p refs
(IIASA-RR-82-14; ISBN-3-7045-0034-8) Copyright. Avail: Issuing Activity

Trends in energy demand, per capita consumption, production, and transportation were assessed for all the major world regions, except China and Asian countries with centrally planned economies. High and low economic growth rates relative to 1975, were considered. Energy demand in developed regions is expected to increase by a factor of 1.8 to 2.6. In developing regions it increases by a factor of 7 to 12. Per capita consumption in developed regions increases from a level of 2.8 to 7.9 kw to 3.9 to 11.6 kw; in developing countries it increases from 0.2 to 0.8 kw to 0.5 to 4.6 kw. The share of electricity in final energy continues to increase. Manufacturing activities remain the major energy consumers. Fossil fuels will remain the most important energy source. Author (ESA)

N82-31767 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THE GROWTH OF ENERGY CONSUMPTION AND PRICES IN THE USA, WEST GERMANY, AND THE UK, 1950 TO 1980
Claire P. Doblin May 1982 152 p refs
(IIASA-RR-82-18; ISBN-3-7045-0028-3) Copyright. Avail: NTIS Avail: Issuing Activity

The relationship between energy price and consumption was studied, especially reactions to oil price rises in the 1970's. Industrial, domestic, and road transportation energy consumption were examined. Until 1973, consumption rose steadily, while the inflation-adjusted price dropped. Immediate reaction to the two large price rises was a drop in consumption, but overall consumption continued to grow when the growth in total energy consumption was reversed. This change is due to adverse business conditions, displacement of coal by oil, oil by gas, and mineral fuels by electricity in given sectors, switches to less energy intensive activities, a change in the mix of gross national products, and weather conditions, as well as by price rises. Energy conservation measures had little impact. Author (ESA)

N82-31768# Weil (Warren) Associates, Inc., Washington, D.C.
FEDERAL EMPLOYEE ENERGY AWARENESS PROGRAM GUIDE
Sep. 1981 68 p refs
(Contract DE-AC08-80CS-21388)
(DOE/CS-21388/2) Avail: NTIS HC A04/MF A01

The planning and management of an employee energy awareness program aimed at reconditioning employees concerning the necessity for energy conservation is described. The program aims to introduce some specific energy conserving behaviors, and to provide motivation for these behaviors. Advice is given on how to structure programs, set goals, implement strategies, and establish procedures for program evaluation and change. R.J.F.

N82-31769*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MICRONIZED COAL BURNER FACILITY Patent Application
F. D. Calfo and M. W. Lupton, inventors (to NASA) Filed 30 Jun. 1982 13 p
(NASA-Case-LEW-13426-1; US-Patent-Appl-SN-393588) Avail: NTIS HC A02/MF A01 CSCL 10B

A combustor or burner system in which the ash resulting from burning a coal in oil mixture is of submicron particle size is described. The burner system comprises a burner section, a flame exit nozzle, a fuel nozzle section, and an air tube by which preheated air is directed into the burner section. Regulated air pressure is delivered to a fuel nozzle. Means are provided for directing a mixture of coal particles and oil from a drum to a nozzle at a desired rate and pressure while means returns excess fuel to the fuel drum. Author

N82-31770*# Computer Sciences Corp., Hampton, Va.
NECAP - NASA'S ENERGY COST ANALYSIS PROGRAM. OPERATIONS MANUAL Final Report
David L. Miner Jun. 1982 85 p refs
(Contract NAS1-16078)
(NASA-CR-165802; NAS 1.26:165802) Avail: NTIS HC A05/MF A01 CSCL 10A

The use of the NASA'S ENERGY COST ANALYSIS PROGRAM (NECAP) is described. Supplementary information on new capabilities and program options is also provided. The Control Data Corporation (CDC) NETWORK OPERATING SYSTEM (NOS) is discussed. The basic CDC NOS instructions which are required to successfully operate NECAP are provided. Author

N82-31771*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EXPERIMENTAL EVALUATION OF THE BATTELLE ACCELERATED TEST DESIGN FOR THE SOLAR ARRAY AT MEAD, NEBRASKA
P. O. Frickland and J. Repar 6 Apr. 1982 46 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356)
(NASA-CR-169281; JPL-Pub-82-52; DOE/JPL-10-12-73; NAS 1.26:169281) Avail: NTIS HC A03/MF A01 CSCL 10B

A previously developed test design for accelerated aging of photovoltaic modules was experimentally evaluated. The studies included a review of relevant field experience, environmental chamber cycling of full size modules, and electrical and physical evaluation of the effects of accelerated aging during and after the tests. The test results indicated that thermally induced fatigue of the interconnects was the primary mode of module failure as measured by normalized power output. No chemical change in the silicone encapsulant was detectable after 360 test cycles.

Author

N82-31772*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
WORKSHOP ON AN ASSESSMENT OF GAS-SIDE FOULING IN FOSSIL FUEL EXHAUST ENVIRONMENTS
W. J. Marner, ed. and R. L. Webb, ed. Jul. 1982 154 p refs Workshop held at Boulder, Colo., 8-9 Oct. 1981
(Contracts NAS7-100; DE-AI07-80ID-12138)
(NASA-CR-169269; JPL-Pub-82-67; NAS 1.26:169269; DOE/ID-12138/1) Avail: NTIS HC A08/MF A01 CSCL 10B

The state of the art of gas side fouling in fossil fuel exhaust environments was assessed. Heat recovery applications were emphasized. The deleterious effects of gas side fouling including increased energy consumption, increased material losses, and loss of production were identified. S.L.

N82-31773*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHOTOVOLTAIC MODULE ENCAPSULATION DESIGN AND MATERIALS SELECTION, VOLUME 1
E. Cuddihy, W. Carroll, C. Coulbert, A. Gupta, and R. H. Liang 1 Jun. 1982 166 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356; JPL Proj. 5101-177) (NASA-CR-169265; JPL-Publ-81-102-Vol-1; DOE/JPL-10-12-60-Vol-1; NAS 1.26:169265) Avail: NTIS HC A08/MF A01 CSCL 10B

Encapsulation material system requirements, material selection criteria, and the status and properties of encapsulation materials and processes available are presented. Technical and economic goals established for photovoltaic modules and encapsulation systems and their status are described. Available encapsulation technology and data are presented to facilitate design and material selection for silicon flat plate photovoltaic modules, using the best materials available and processes optimized for specific power applications and geographic sites. The operational and environmental loads that encapsulation system functional requirements and candidate design concepts and materials that are identified to have the best potential to meet the cost and performance goals for the flat plate solar array project are described. Available data on encapsulant material properties, fabrication processing, and module life and durability characteristics are presented. E.A.K.

N82-31774*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHOTOTHERMAL CHARACTERIZATION OF ENCAPSULANT MATERIALS FOR PHOTOVOLTAIC MODULES
R. H. Liang, Amitava Gupta, and Salvador Distefano 1 Jun. 1982 77 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356; JPL Proj. 5101-210) (NASA-CR-169267; JPL-Publ-82-42; NAS 1.26:169267) Avail: NTIS HC A05/MF A01 CSCL 10A

A photothermal test matrix and a low cost testing apparatus for encapsulant materials of photovoltaic modules were defined. Photothermal studies were conducted to screen and rank existing as well as future encapsulant candidate materials and/or material formulations in terms of their long term physiochemical stability under accelerated photothermal aging conditions. Photothermal characterization of six candidate pottant materials and six candidate outer cover materials were carried out. Principal products of photothermal degradation are identified. Certain critical properties are also monitored as a function of photothermal aging. E.A.K.

N82-31775*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN INVESTIGATION OF THE EFFECT OF WIND COOLING ON PHOTOVOLTAIC ARRAYS
L. Wen Mar. 1982 50 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356; JPL Proj. 5101-201) (NASA-CR-169263; JPL-Publ-82-28; DOE/JPL-10-12-69; NAS 1.26:169263) Avail: NTIS HC A03/MF A01 CSCL 10A

Convective cooling of photovoltaic modules for different wind conditions, including steady state controlled testing in a solar simulator and natural test environments in a field was investigated. Analytical thermal models of different module designs were used to correlate experimental data. The applicability of existing heat transfer correlations is confirmed. Reasonable agreement is obtained by applying a power law wind profile. E.A.K.

N82-31776*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GAS TURBINE CRITICAL RESEARCH AND ADVANCED TECHNOLOGY (CRT) SUPPORT PROJECT Annual Report, Fiscal Year 1980
Edward R. Furman, David N. Anderson, Michael A. Gedwill, Jr., Carl E. Lowell, and Donald F. Schultz Jul. 1982 47 p refs
(Contract DE-AI01-77ET-10350)
(NASA-TM-82872; E-1247; NAS 1.15:82872) Avail: NTIS HC A03/MF A01 CSCL 10A

The technical progress to provide a critical technology base for utility gas turbine systems capable of burning coal-derived fuels is summarized. Project tasks include the following: (1) combustion - to investigate the combustion of coal-derived fuels and the conversion of fuel-bound nitrogen to NOx; (2) materials - to understand and prevent the hot corrosion of turbine hot section materials; and (3) system studies - to integrate and guide the technological efforts. Technical accomplishments include: an extension of flame tube combustion testing of propane - Toluene Fuel Mixtures to vary H2 content from 9 to 18 percent by weight and the comparison of results with that predicted from a NASA Lewis General Chemical Kinetics Computer Code; the design and fabrication of combustor sector test section to test current and advanced combustor concepts; Testing of Catalytic combustors with residual and coal-derived liquid fuels; testing of high strength super alloys to evaluate their resistance to potential fuel impurities using doped clean fuels and coal-derived liquids; and the testing and evaluation of thermal barrier coatings and bond coatings on conventional turbine materials. Author

N82-31777*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON THE CAUSE OF THE FLAT-SPOT PHENOMENON OBSERVED IN SILICON SOLAR CELLS AT LOW TEMPERATURES AND LOW INTENSITIES
V. G. Weizer, J. D. Broder, H. W. Brandhorst, and A. F. Forestieri 1982 14 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, England, 4-6 May 1982; sponsored by RAE, U.K. Dept. of Industry and ESA.
(NASA-TM-82903; E-1286; NAS 1.15:82903) Avail: NTIS HC A02/MF A01 CSCL 10A

A model is presented that explains the 'flat-spot' (FS) power loss phenomenon observed in silicon solar cells operating deep space (low temperature, low intensity) conditions. Evidence is presented suggesting that the effect is due to localized metallurgical interactions between the silicon substrate and the contact metallization. These reactions are shown to result in localized regions in which the PN junction is destroyed and replaced with a metal-semiconductor-like interface. The effects of thermal treatment, crystallographic orientation, junction depth, and metallurization are presented along with a method of preventing the effect through the suppression of vacancy formation at the free surface of the contact metallization. Preliminary data indicating the effectiveness of a TiN diffusion barrier in preventing the effect are also given. Author

N82-31778# JBF Scientific Corp., Wilmington, Mass.
ANALYSIS OF THE EFFECTS OF INTEGRATING WIND TURBINES INTO A CONVENTIONAL UTILITY: A CASE STUDY Final Report
M. K. Goldenblatt, H. L. Wegley (Pacific Northwest Lab.), and A. H. Miller (Pacific Northwest Lab.) Aug. 1982 64 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3962) Avail: NTIS HC A04/MF A01

Three aspects of the integration of wind turbine generation (WTG) into a utility generating system are documented. The sensitivity of the economic C to wind speed sampling frequency, wind turbine performance model and wind speed forecasting accuracy were examined. The initial phase of the study consisted

of calculating the expected output of the Boeing MOD-2 wind turbine using various turbine performance models driven by wind data representing different sampling frequencies. The basic wind data set used consisted of instantaneous values of wind speed and direction recorded at 2-min intervals. DOE

N82-31779# Gould, Inc., Rolling Meadows, Ill. Energy Systems Labs.

STUDIES LEADING TO THE DEVELOPMENT OF HIGH-RATE LITHIUM SULFURY CHLORIDE BATTERY TECHNOLOGY Quarterly Report, 1 Sep. - 31 Dec. 1981

Faruk Marikar Mar. 1982 56 p

(Contract DAAK20-81-C-0420; DA Proj. 1L1-62705-AH-94)

(AD-A116381; DELET-TR-81-0420-1; QR-1; Rept-827-001) Avail: NTIS HC A04/MF A01 CSCL 10/3

The overall aim of the program is an examination of the viability of an active electrolyte lithium/sulfuryl chloride battery system. The specific objectives are to quantify the stability of lithium in sulfuryl chloride solutions; explore the means to improve the stability of lithium; and establish the limits of performance of carbon/teflon cathodes in sulfuryl chloride electrolytes. During this quarter we measured the rates of corrosion of lithium in sulfuryl chloride in cells and sealed capsules by microcalorimetry; estimated by complex plane impedance measurements; followed the growth of the film on cell storage, its disruption on polarization and its healing following polarization; established the baseline cathode performance; and measured the conductivity and density of SO2Cl2-LiAlCl4 electrolysis at ambient and high temperature.

Author (GRA)

N82-31780# Sveriges Lantbruksuniv., Lund. Inst. fuer Lantbrukets Byggnadsteknik.

PREPARATORY EXPERIMENTS ON SEASONAL STORAGE IN EARTH OF EXCESS HEAT FROM GREENHOUSE

Mats Areskoug and Peter Wigstroem 1980 50 p refs In SWEDISH

(DE82-900623; SLU-LBT-11) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

An earth heat accumulator, directly beneath an experimental greenhouse, with possibilities for collecting excess solar heat by pumps and utilization of low temperature heat was investigated. Heat exchange with the accumulator is made by a system of buried polyethylene pipes. The heat accumulator was loaded by excess solar heat from the greenhouse, using heat pumps, during two summer months. A theoretical model for the heat flow in the accumulator was used to study the heat balance in the accumulator and its interaction with surrounding soil and greenhouse. The heat flow through the soil surface is utilized by the greenhouse giving a higher root zone temperature and a higher air temperature. It is suggested that a heat accumulator should be placed deeper beneath the soil surface. Its extension in depth should be larger, (about 10 to 15 m) in the specific boulder clay investigated. It is concluded that the method which uses buried horizontal pipes is not usable, and a technique for vertical pipe systems with high heat transfer must be investigated. DOE

N82-31781# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

LABORATORY EXPERIMENTS ON HEAT AND MASS EXTRACTION FROM SOLAR PONDS Quarterly Report, 1 Jul. 1981 - 30 Sep. 1981

F. Zangrando Jan. 1982 20 p refs

(Contract DE-AC02-77CH-00178)

(DE82-007770; SERI/PR-252-1461; QR-2) Avail: NTIS HC A02/MF A01

The physical parameters that govern the flow and the related thermal field in the solar pond are defined, and simplified analytical models of the process are presented. Experimental goals to be pursued are determined and a preliminary design is presented for the experimental facility to be constructed. DOE

N82-31782# Sandia Labs., Albuquerque, N. Mex.

INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 5: FOR MT. LAGUNA RADAR STATION, MT. LAGUNA, CALIFORNIA

Dec. 1981 23 p refs

(Contract DE-AC04-76DP-00789)

(DE82-010949; SAND-81-7090/5) Avail: NTIS HC A02/MF A01

For the month of November, 1981, performance data are given for a photovoltaic power supply at a California radar station. Data given include: daily and monthly electric energy production; daily and monthly solar energy incident; daily and monthly array efficiency; electric energy production vs. power level, voltage, cell temperature, and hour of the day; power conditioning system input, output, and efficiency; daily and monthly electric energy provided by the photovoltaic system to the load; photovoltaic system efficiency; capacity factor; system availability; heating and cooling degree days; daily and hourly insolation, ambient temperature, and wind speed; wind direction distribution; hourly cell temperature; number of freeze-thaw cycles; and system efficiency. Also included is a brief narrative section to provide information not easily included in the computer-generated modules. DOE

N82-31783# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.

DESIGN OF A PHOTOVOLTAIC SYSTEM FOR A PASSIVE DESIGN NORTHEAST ALL-ELECTRIC RESIDENCE

E. M. Mehalick, G. F. Tully, J. Johnson, J. Parker, and R. Felice Jan. 1982 174 p refs

(Contract DE-AC04-76DP-00789)

(DE82-010859; SAND-80-7171) Avail: NTIS HC A08/MF A01

A photovoltaic system was developed and integrated into a passively designed, low energy consuming home suitable for the Northeast region of the country. The selected array size is 4.1 kW and covers 51 square meters of roof area. The design addresses the residential market segment of low energy consuming houses with limited roof area availability for photovoltaic arrays. A direct mount, next generation, larger sized, photovoltaic shingle module is used to reduce installation costs over earlier generation shingle modules. A 4 kW line-commutated inverter is used in the power conversion subsystem, since it is representative of currently available equipment. The complete system and house design are described, including all the pertinent installation and construction drawings. Specific performance results are presented for the Boston and Madison region. The system design presented, coupled with previously completed designs, provide a set of design options expected to be available to residential homeowners in the mid 1980's. DOE

N82-31784# General Electric Co., Schenectady, N. Y. Corporate Research and Development.

POLKA DOT SOLAR CELL Final Report, 1 Apr. 1980 - 29 May 1981

1981 40 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-006856; SERI/TR-9010-2-T1) Avail: NTIS HC A03/MF A01

Polka dot solar cells are discussed. A model was developed for thick epitaxial layer front junctions with moderate doping levels. The dependence of surface recombination velocity on doping is briefly discussed and epitaxial emitter cell fabrication by solution growth of Si from Sn is described. Two electron beam methods were used to determine the minority carrier diffusion lengths in the epitaxial layers. Arsenic diffusion from Sn-As sources is examined. Some possible modifications to the polka dot cell process are described. DOE

N82-31785# Photowatt International, Inc., Tempe, Ariz.

FEASIBILITY STUDY OF MICROWAVE APPLICATION FOR SOLAR CELL FABRICATION Final Report

Sanjeev Chitre and Micheal C. Keeling Jan. 1982 69 p refs

(Contract DE-AC02-77CH-00178)

(DE82-010121; SERI/TR-8041-16-T2) Avail: NTIS HC A04/MF A01

The application of microwave energy in heating for junction

formation, back surface field formation, metallization sintering and combinations of these operations was studied. During the initial phases, the product produced did not confirm to the theoretical predictions. As a result, a mathematical model was generated and a computer analysis made. The initial expectations are outlined, and the model and results of the computer analysis are reported. Two generations of equipment were designed and a third generation conceptualized. The first instrument (single mode, single pass) was not capable of uniformly heating wafers above 6000 C. This was rectified in the second instrument which utilized amixed mode, multiple pass cavity. A discussion of the results of experiments on sintering, diffusion, and simultaneous front and back surface junction formation is presented with a tabular summary. The overall results were positive with particularly encouraging results on the front junction formation. In spite of a very low factor (0.67), the efficiency of the cells averaged 9.8% with a maximum of 10.7%. DOE

N82-31786# Princeton Univ., N. J. Dept. of Chemical Engineering.

HYDROGEN GENERATION BY PHOTOASSISTED HETEROGENEOUS CATALYSIS WITH OPTICAL FIBERS Final Report

David Ollis (California Univ., Davis) 22 Dec. 1981 12 p

(Contract DE-AS01-77ET-20027)

(DE82-007591; DOE/ET-20027/T1) Avail: NTIS HC A02/MF A01

Heterogeneous photocatalyst configurations involving optical fiber, semiconductor oxide, and metal complex materials were synthesized, characterized spectrally and electrochemically, and assembled in larger components suitable for incorporation into reactors utilizing catalyst coated optical fibers. Reactor design predictions were developed which allow the performance to be calculated for reactor utilizing photocatalyst materials of known properties (quantum yield, index of refraction). Experimental developments with ruthenium complexes and TiO2 powders establish that preparation of these materials into the proposed reactor configurations was possible with complexes and was achieved with TiO2 powders. However, catalytic inactivity of ruthenium complexes, and unfavorable index of refraction values deduced or TiO2 led to lack of a successful reactor prototype at the conclusion of the contract period. DOE

N82-31787# California Univ., Livermore. Lawrence Livermore Lab.

AUTOMOBILE FLYWHEEL ENERGY STORAGE: PRACTICAL VACUUM REQUIREMENTS

D. N. Frank and N. Milleron 23 Oct. 1981 19 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981

(Contract W-7405-eng-48)

(DE82-003151; UCRL-86822; CONF-811113-31) Avail: NTIS HC A02/MF A01

For passenger automobiles with 1367 kg curb weight during typical driving conditions in city traffic, fuel efficiency improvements of 50 to 100% (5 to 7 km) can be realized by proper utilization of a flywheel energy storage unit (0.2 kWh) and a heat engine. The pros and cons of flywheels compared to other energy storage options are discussed. Discussion is then given regarding a serious concern of composite flywheel energy storage for vehicles, that of a suitable vacuum environment for the rotating, composite flywheel. To be practical, a vacuum system for such an environment must be reliable, safe and economical to manufacture, monitor, maintain and repair. Each embodiment of flywheel energy storage may be sufficiently unique to require a vacuum environment tailored to suit it. A general discussion of the important vacuum parameters and practical vacuum systems is followed by examples of candidate designs. DOE

N82-31788# California Univ., Berkeley. Lawrence Berkeley Lab.

IMPROVED ENERGY RECOVERY FROM GEOTHERMAL RESERVOIRS

Gudmundur S. Boedvarsson, Karsten Pruess, Marcelo Lippmann, and Sveinbjoern Bjoernsson Jun. 1981 26 p refs Presented at the 56th Ann. Tech. Conf. and Exhibition of the Soc. of Petroleum Engrs. of AIME, San Antonio, Texas, 4-7 Oct. 1981

(Contract W-7405-eng-48)

(DE82-001007; LBL-12341; CONF-811023-5) Avail: NTIS HC A03/MF A01

Numerical simulation methods are used to study how the exploitation of different horizons affects the behavior of a liquid-dominated geothermal reservoir. The reservoir model is a schematic representation of the Olkaria field in Kenya. The model consists of a two phase vapor dominated zone overlying the main liquid dominated reservoir. Four different cases were studied, with fluid produced from: (1) the vapor zone only, (2) the liquid zone only, (3) both zones and (4) both zones, but assuming lower values for vertical permeability and porosity. The results indicate that production from the shallow two phase zone, although resulting in higher enthalpy fluids, may not be advantageous in the long run. Shallow production gives rise to a rather localized depletion of the reservoir, whereas production from deeper horizons may yield a more uniform depletion process, if vertical permeability is sufficiently large. DOE

N82-31789# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.

SIMPLE MODEL FOR FAULT-CHARGED HYDROTHERMAL SYSTEMS

Gudmundur S. Boedvarsson, Constance W. Miller, and Sally M. Benson Aug. 1981 25 p refs

(Contract W-7405-eng-48)

(DE82-001510; LBL-12869-Rev) Avail: NTIS HC A02/MF A01

A two-dimensional transient model of fault-charged hydrothermal systems has been developed. The model can be used to analyze temperature data from fault-charged hydrothermal systems, estimate the recharge rate from the fault, and determine how long the system has been under natural development. The model can also be used for theoretical studies of the development of fault-controlled hydrothermal systems. The model has been tentatively applied to the low-temperature hydrothermal system at Susanville, California. A reasonable match was obtained with the observed temperature data. DOE

N82-31790# California Univ., Berkeley. Lawrence Berkeley Lab.

DAYLIGHTING AS A DESIGN AND ENERGY STRATEGY: OVERVIEW OF OPPORTUNITIES AND CONFLICTS

Stephen Selkowitz Jun. 1981 10 p Presented at the Energy and Big Building Design Symp., Philadelphia, 25-26 May 1981 Submitted for publication

(Contract W-7405-eng-48)

(DE82-001022; LBL-13171; CONF-8105107-2; EEB-W-81-14) Avail: NTIS HC A02/MF A01

The potentials and problems associated with using daylight both to improve visual performance and interior aesthetics and to reduce electrical lighting energy consumption and peak electric loads are reviewed. Use of daylighting as a design strategy is not always synonymous with effective use of daylighting as an energy-saving strategy unless both approaches are jointly pursued by the design team. Criteria for visual performance, disability and discomfort glare, historical perspectives on daylight utilization, building form as a limit to daylight penetration, beam sunlighting strategies, luminous efficacy of daylight versus efficient electric light sources, comparative thermal impacts, peak load and load management potential, and nonenergy benefits are reviewed. Although the energy benefits of daylighting can be oversold, it is concluded that in most cases a solid understanding of the energy and design issues should produce energy efficiency and pleasing working environments. DOE

N82-31791# Department of Energy, Washington, D. C. Energy Information Administration.

THE NATIONAL INTERIM ENERGY-CONSUMPTION SURVEY: EXPLORING THE VARIABILITY IN ENERGY CONSUMPTION, A SUPPLEMENT

Robert B. Latta Oct. 1981 40 p

(DE82-002002; DOE/EIA-0272/S) Avail: NTIS HC A03/MF A01

The variability in energy consumption is examined in single family detached units using fuel oil, kerosene, electricity, and natural gas. DOE

N82-31792# Roskilde Univ. (Denmark). Inst. for Studiet of Matematik og Fysik Samt Deres Functioner i Undervisning, Forskning og Anvendelser.
PLANNING AND POLICY CONSIDERATIONS RELATED TO THE INTRODUCTION OF RENEWABLE ENERGY SOURCES INTO ENERGY SUPPLY SYSTEMS. ENERGY SERIES NO. 3
B. Sorensen Jan. 1981 59 p refs
(DE82-900828; TEKST-41) Avail: NTIS HC A04/MF A01

Elements of a methodology for long term energy planning with particular reference to the introduction of renewable energy technologies, and a methodology for comparative assessment of energy systems are discussed. The discussion comprises technical and economic viability, indirect economy, environmental and social impacts, as well as the influence of uncertainty on the assessment. The role of renewable energy in future energy supply systems is discussed, with separate treatment of the situation in developing countries and in highly industrialized countries. Finally, mechanisms for the mobilization of technical and financial requirements are touched upon. DOE

N82-31793# Oak Ridge National Lab., Tenn. Engineering Technology Div.
MINNEAPOLIS DISTRICT-HEATING OPTIONS
T. K. Stovall, R. J. Borkowski, M. A. Karnitz, Sheldon Strom (City of Minneapolis), and Ken Linwick (Minnegasco Energy Center) Oct. 1981 93 p refs
(Contract W-7405-eng-26)
(DE82-002004; ORNL/TM-7780) Avail: NTIS HC A05/MF A01

The feasibility of a large-scale district heating system for the Minneapolis central city area was investigated. The analysis was based on a previous city of St. Paul Hot-water district heating study and other studies done by a Swedish engineering firm. Capital costs such as building and heat source conversion, pipeline construction, and equipment were used in comparing the projected expenses of various district heating scenarios. Options such as coal, refuse-derived fuel burning, and cogeneration at the Riverside Power Station were discussed as energy supplies for a cost-effective district heating system. DOE

N82-31794# Geothermal Research, Information and Planning Services Commission, Santa Rosa, Calif.
G.R.I.P.S ACTIVITIES IN THE DEVELOPMENT OF DIRECT USE OF GEOTHERMAL RESOURCES AND SMALL SCALE GEOTHERMAL POWER DEVELOPMENT Final Report
Oct. 1981 137 p
(Contract DE-FC03-79ET-27194)
(DE82-002842; DOE/ET-27194/T7) Avail: NTIS HC A07/MF A01

The activities of the geothermal research information and planning services (G.R.I.P.S.) in the four Geysers-Calistoga KGRA counties (i.e., Lake, Mendocino, Napa, Sonoma) in California are reported. Activities in the G.R.I.P.S. information and outreach program, workshop presentations, pilot project development, permit processing improvements and Department of Energy reporting are described. DOE

N82-31795# General Electric Co., Philadelphia, Pa.
EVALUATION OF TECHNICAL FEASIBILITY OF CLOSED-CYCLE NON-EQUILIBRIUM MHD POWER GENERATION WITH DIRECT COAL FIRING Final Report
Nov. 1981 164 p refs
(Contract DE-AC01-78ET-10818)
(DE82-007104; DOE/ET-10818/T2-Vol-2-App) Avail: NTIS HC A08/MF A01

Program accomplishments in a continuing effort to demonstrate the feasibility of direct coal-fired, closed-cycle magnetohydrodynamic (MHD) power generation are reported. A user's manual for a two-dimensional MHD generator code and performance estimates for a nominal 30 MW argon segmented heater are given. The feedwater cooled Brayton cycle is discussed as well as the application of closed cycle MHD in an industrial cogeneration environment. Preliminary design for shell and tube primary heat exchanger and plant efficiency as a function of output power for open and closed cycle MHD power plants are also discussed. DOE

N82-31796# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
FUNDAMENTAL HEAT-TRANSFER PROCESSES RELATED TO PHASE-CHANGE THERMAL-STORAGE MEDIA
E. M. Sparrow Jan. 1982 15 p refs
(Contract DE-AS02-79ER-10343)
(DE82-007944; DOE/ER-10343/03) Avail: NTIS HC A02/MF A01

Fundamental heat transfer processes which occur in phase change thermal storage systems is described. Five interrelated research problems are described. The first two of the problems deal with phase change which occurs inside a vertical tube. The encapsulated storage concept whereby the phase change medium is contained within a sealed tube while the flowing heat transfer fluid passes over the outside of the tube were studied. The results included the heat extracted (for freezing), and heat input (for melting), and the separate contributions of the latent heat energy and of the sensible heat energies of the liquid and the solid phases. The shapes of the freezing and melting fronts were measured directly. Convection has a strong effect on the melting results, the freezing results are little affected by natural convection. A finite difference method was formulated to solve two dimensional phase changes in the freezing problem which occurs when a coolant carrying tube passes through a phase change medium. The natural convection heat transfer coefficients associated with freezing outside a cooled vertical tube was determined. It is found that the coefficients are insensitive to the thickness of the frozen layer. This legitimizes the use of a time independent local heat transfer coefficient in the analysis of the timewise growth of the frozen layer. DOE

N82-31797# Midwest Research Inst., Golden, Colo.
DECISION CRITERIA OF POTENTIAL SOLAR IPH ADAPTERS
E. Perwin, A. Levine, G. Mikasa, R. Noun, and D. Schaller Dec. 1981 58 p refs
(Contract DE-AC02-77CH-00178)
(DE82-007002; SERI/TR-663-1032) Avail: NTIS HC A04/MF A01

If national programs are to be effective in the research and development of viable renewable resource technologies for the industrial sector, understanding industry's decision criteria will be important. The results of a preliminary investigation of the decision criteria of potential and actual users of solar industrial process heat systems are presented. Detailed interviews were completed with decision-makers from ten manufacturing firms. Based on economic theory, it was assumed that corporate decision-makers assess the expected cost, revenue, and uncertainty of competing investment opportunities. These decision criteria are composed of factors that are financial, technical, and institutional. Clearly, the firms interviewed were more concerned with costs than any other category of decision criteria. Most of the firms also believed that there was less uncertainty with competing investments than with current solar technology. Based on this preliminary investigation, a more extensive survey of industrial firms is suggested to determine a more comprehensive list of significant decision criteria. DOE

N82-31798# Brookhaven National Lab., Upton, N. Y. Biomedical and Environmental Assessment Div.
HEALTH RISKS OF PHOTOVOLTAIC ENERGY TECHNOLOGIES
P. D. Moskowitz, L. D. Hamilton, S. C. Morris, K. M. Novak, C. V. Robinson, and M. D. Rowe 1981 6 p refs Presented at the Intern. Symp. on Health Impacts of Different Sources of Energy, Nashville, Jun. 1981
(Contract DE-AC02-76CH-00016)

(DE82-011527; BNL-30745; CONF-810652-8) Avail: NTIS HC A02/MF A01

Health risks of photovoltaic energy technologies arise from mining, processing and refining of raw materials, and fabrication, installation, operation, and disposal of devices used to convert sunlight into useful energy. Using an accounting approach, public and occupational health risks are examined for four different photovoltaic cell alternatives: silicon single-crystal cells produced by an ingot process; silicon metal/insulator/semiconductor cells produced by ribbon growing; cadmium sulfide backwall cells produced by spray deposition; and gallium arsenide cells produced by modified ingot-growing. These alternatives cover a range of manufacturing options (e.g., ingot versus spray deposition) and materials (silicon versus arsenic) which might be used in future commercialization efforts. Most occupational mortality and morbidity effects probably relate to industrial risks similar to those encountered in the day-to-day operation of any industrial operation. Material supply, installation, and operation appear to contribute substantial portions of the damage. DOE

N82-31799# Los Alamos Scientific Lab., N. Mex.
PROGRESS OF THE US HOT-DRY-ROCK PROGRAM
M. C. Smith 1982 26 p refs Presented at the Intern. Conf. on Geothermal Energy, Florence, Italy, May 1982
(Contract W-7405-eng-36)
(DE82-004364; LA-UR-81-3431; CONF-820506-1) Avail: NTIS HC A03/MF A01

The Hot Dry Rock (HDR) which concentrates on the use of hydraulic fracturing to create flow passages and heat transfer surface between two wells drilled into hot crystalline rock of low initial permeability was studied. A recirculating pressurized water loop was used to extract heat at rates up to 5MW(t) from a system of this type in granitic rock at a depth of 2600 m. Two wells for a larger, deeper, hotter system were drilled at the same location. They will be connected by a set of hydraulic fractures, and the resulting heat extraction loop is expected to yield the engineering experience and performance data which are required to demonstrate the commercial usefulness of such systems. The HDR resource base of the United States is evaluated and local areas that appear especially promising either for future heat extraction experiments or for eventual commercial development are investigated. DOE

N82-31800# Grumman Aerospace Corp., Bethpage, N.Y.
PRELIMINARY DESIGN AND ECONOMIC INVESTIGATIONS OF DIFFUSER-AUGMENTED WIND TURBINES (DAWT). EXECUTIVE SUMMARY Final Report, 15 May 1979 - 31 Mar. 1980
K. M. Foreman Dec. 1981 26 p refs Prepared in Cooperation with Midwest Research Inst.
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-008515; SERI/TR-98073-1A) Avail: NTIS HC A03/MF A01

A preferred design and configuration approach for the diffuser augmented wind turbine (DAWT) innovative wind energy conversion system is suggested. A preliminary economic assessment is made for limited production rates of units between 5 and 150 kW rated outputs. Nine point designs are used to arrive at the conclusions regarding best construction material for the diffuser and busbar cost of electricity (COE). It is estimated that for farm and cooperative end users, the COE can range between 2 and 3.5 cents pr kWh for sites with annual average wind speeds of 16 and 12 mph (25.7 and 19.3 km/h) respectively, and 150 kW rated units. No tax credits are included in these COE figures. For commercial end users of these 150 kW units, the COE ranges between 4.0 and 6.5 cents per kWh for 16 and 12 mph sites. These estimates in 1971 dollars are lower than department of energy goals set in 1978 for the rating size and end applications. Recommendations are made for future activities to maintain steady, systematic progress toward mature development of the DAWT. DOE

N82-31801# Booz-Allen and Hamilton, Inc., Bethesda, Md. Energy and Environment Div.
PASSIVE ACTIVE CONSERVATION EVALUATOR, PACE USER'S MANUAL
Jun. 1981 216 p Prepared for Midwest Research Inst., Golden, Colo.
(Contracts DE-AC02-77CH-00178; EG-77-C-01-40442)
(DE82-010686; SERI/TR-98252-1) Avail: NTIS HC A10/MF A01

The use is described of the PACE computer program, developed as an analysis tool for the study of the economics and financing of active and passive solar energy systems. The program permits analysis of space and water heating systems based on active system algorithms and the solar load ratio passive system algorithms. Several types of analyses and reports are described which the model is capable of producing. Instructions are provided for using the model. The reports available from the program are described in detail. User reference data are included. DOE

N82-31802# Booz-Allen and Hamilton, Inc., Bethesda, Md. Energy and Environment Div.
PASSIVE ACTIVE CONSERVATION EVALUATOR. PACE PROGRAMMER'S MANUAL
Nov. 1981 380 p Prepared for Midwest Research Inst., Golden, Colo.
(Contracts DE-AC02-77HC-00178; EG-77-C-01-4042)
(DE82-010722; SERI/TR-98252-2) Avail: NTIS HC A17/MF A01

The program features, programming conventions, and algorithms of the PACE computer program are described. This manual is intended to aid programmers in installing and modifying the program. Written descriptions of program routines, a listing of the program and is data base, a section on programming conventions, an explanation of the algorithms within the program, and advice on installation of PACE are included. DOE

N82-31803# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 6: FOR NEWMAN POWER STATION, EL PASO, TEXAS
Dec. 1981 24 p 6 Vol.
(Contract DE-AC04-76DP-00789)
(DE82-010946; SAND-81-7086/6) Avail: NTIS HC A02/MF A01

For the month of November, 1981, performance data are given for the photovoltaic power supply at a Texas utility. Data given include: daily and monthly electrical energy produced; daily and monthly incident solar energy; daily and monthly array efficiency; electrical energy produced versus power level, voltage, cell temperature, and hour of the day; daily and monthly energy delivered from the photovoltaic system to the load; daily system availability; heating and cooling degree days; monthly and hourly ambient temperature, wind speed and insolation; and wind direction distribution. Some site events are reported, and a brief narrative section is included to provide information not easily included in the computer generated modules. DOE

N82-31804# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EVALUATION AND MARKET TESTING OF CORNING CODE 7809 THIN SOLAR GLASS
R. T. Coyle and Rob Livingston Dec. 1981 30 p refs
(Contracts DE-AC02-77CH-0017; EG-77-C-01-4042)
(DE82-010750; SERI/TR-733-1230) Avail: NTIS HC A03/MF A01

A thin, flat glass, 7809 was developed for an advanced solar energy reflector. The melting properties of 7809 glass, and the forming of thin sheets of this glass by the fusion process were tested. Glass manufactured in this experiment was distributed to 17 participants in a program developed to evaluate the glass in concentrating collector applications. A multilaboratory effort was organized to measure the physical properties of the glass. The 7809 glass exhibited good melting properties, had 91.7% transmittance, and had outstanding durability and fracture properties. DOE

N82-31805# New Mexico State Univ., Las Cruces. Solar Energy Inst.

DATA REPORT FOR THE SOUTHWEST RESIDENTIAL EXPERIMENT STATION, NOVEMBER 1981
M. Lieberman, O. Y. Hai, G. Hocking, and C. Whitaker 18 Dec. 1981 22 p refs
(Contract DE-AC02-76ET-20279)
(DE82-011197; DOE/ET-20279/176) Avail: NTIS HC A02/MF A01

The Southwest Residential Experiment Station (SW RES) is operated in Las Cruces, New Mexico. Physical performance data obtained from the photovoltaic energy systems under test at the SW RES are tabulated. DOE

N82-31806# Midwest Research Inst., Golden, Colo. Solar Energy Reseach Inst.
INTEGRATED ALTERNATIVE ENERGY SYSTEMS FOR USE IN SMALL COMMUNITIES
J. Thornton Jan. 1982 27 p refs Presented at the Seminar on Solar Energy Appl. for Buildings, Mexico City, 17-19 Nov. 1980
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-007769; SERI/TP-731-1057) Avail: NTIS HC A03/MF A01

This paper summarizes the principles and conceptual design of an integrated alternative energy system for use in typical farming communities in developing countries. A system is described that, utilizing the Sun and methane produced from crop waste, would supply sufficient electric and thermal energy to meet the basic needs of villagers for water pumping, lighting, and cooking. The system is sized to supply enough pumping capacity to irrigate 101 ha (249 acres) sufficiently to optimize annual crop yields for the community. Three economic scenarios were developed, showing net benefits to the community of $3,578 to $15,547 anually, payback periods of 9.5 to 20 years, and benefit-to-cost ratios of 1.1 to 1.9. DOE

N82-31807# Argonne National Lab., Ill. Energy and Environmental Systems Div.
GUIDE TO THE ECONOMIC ANALYSIS OF COMMUNITY ENERGY SYSTEMS
W. P. Pferdehirt, K. G. Croke (Illinois Univ., Chicago), A. P. Hurter (Northwestern Univ.), A. S. Kennedy, and C. Lee Aug. 1981 66 p refs
(Contract W-31-109-eng-38)
(DE82-011465; ANL/CNSV-TM-92) Avail: NTIS HC A04/MF A01

This guidebook provides a framework for the economic analysis of community energy systems. The analysis facilitates a comparison of competing configurations in community energy systems, as well as a comparison with conventional energy systems. Various components of costs and revenues to be considered are discussed in detail. Computational procedures and accompanying worksheets are provided for calculating the net present value, straight and discounted payback periods, the rate of return, and the savings to investment ratio for the proposed energy system alternatives. These computations are based on a projection of the system's costs and revenues over its economic lifetimes. The guidebook also discusses the sensitivity of the results of this economic analysis to changes in various parameters and assumptions. DOE

N82-31808# Pacific Northwest Lab., Richland, Wash. Div. of Environmental Science and Engineering.
TECHNOLOGY ASSESSMENT REPORT FOR THE SOYLAND POWER COOPERATIVE, INC. COMPRESSED AIR ENERGY STORAGE SYSTEM (CAES)
Jan. 1982 106 p refs
(Contract DE-AC06-76RL-01830)
(DE82-011710; PNL-4077) Avail: NTIS HC A06/MF A01

The design and operational features of compressed air energy storage systems (CAES) in general and, specifically, of a proposed 220 MW plant being planned by the Soyland Power Cooperative, Inc., in Illinois are described. The need for peaking capacity, CAES requirements for land, fuel, water, and storage caverns, are discussed, and the costs, environmental impacts and licensing requirements of CAES are compared with those of power plants using simple cycle or combined cycle combustion turbines. It is concluded that during the initial two years of CAES operation, the CAES would cost more than a combustion turbine or combined cycle facility, but thereafter the CAES would have a increasing economic advantage. The overall environmental impact of a CAES plant is minimal, and there should be no great difficulties with CAES licensing. DOE

N82-31809# Pacific Northwest Lab., Richland, Wash.
AIR-STORAGE SYSTEMS
T. J. Doherty Oct. 1981 15 p refs Presented at the Intern. Energy Storage Conf., Seattle, 19 Oct. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005805; PNL-SA-9438; CONF-811066-9) Avail: NTIS HC A02/MF A01

The air storage system, the critical component making compressed air energy storage technically economically feasible, is described in three of its forms. All have geological containments and reflect economics of scale requiring fairly large plant ratings and storage capacities. All three systems also are based on good precedent experience and there are a number of willing bidders in the engineering and construction field attesting to the readiness of the technology. The salient features of each storage system type are summarized. Hard rock caverns have the widest siting opportunity with a variety of geology, are well within construction capability in good quality rock with maximum control of system design through engineering, and have the highest cost of the storage system options study. They have the potential for longest time to startup and are difficult and expensive to expand for increased storage or plant rating. The salt-solutioned cavern has limited siting opportunities, is a very economical storage system, and storage increase is possible through cavern additions. DOE

N82-31810# Inco Europe Ltd., Birmingham (England).
GMC NICKEL HYDROXIDE ELECTRODE Final Report
T. S. Turner, J. W. Oldfield, D. M. Tallett, and J. Edwards Feb. 1982 164 p
(Contract DE-AC02-80CS-91001)
(DE82-011859; DOE/CS-91001/T6) Avail: NTIS HC A08/MF A01

The ultimate objective of this work is the geometrical optimization of the CMG nickel hydroxide electrode. A proposal for jointly funded research, made in 1980 to the US Department of Energy, embraced two phases. The first covered investigation of the effect on discharged behavior of varying the hole pattern, electrode thickness and nickel hydroxide density. The properties observed were to be compared with the predictions of an existing mathematical model, whose deficiencies would then be identified, and improvements made. In the second phase, the following parameters were to be investigated: foil thickness, weight of active mass per unit area of foil, electrode size and shape. The results were to be applied to make further improvements in the model and to estimate trends in production costs. DOE

N82-31811# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
ENERGY-TECHNOLOGY EVALUATION UTILIZING LINEAR PROGRAMMING MODEL
D. Hill Oct. 1981 10 p refs Presented at the 4th World Energy Eng. Congr., Atlanta, 12-15 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE82-009162; BNL-30885; CONF-811030-4) Avail: NTIS HC A02/MF A01

Formulation of MARKAL (for MARKet ALlocation), a time phased linear program for each member state of the International energy Agency to describe the potential changes in its energy system during the period 1980 to 2020 is discussed. The MARKAL model consists of a set of inequations that describe the constraints on the energy system; e.g., each energy service demand must be satisfied, the consumption of each specific fuel cannot exceed its supply, the amount of electricity that can be produced on a summer day cannot exceed the total installed capacity of electric generating plants taking into account probable unavailable capacity, the growth in capacity from one time period to the next cannot exceed a

specified rate, the amount of oil that can be produced by enhanced recovery techniques in the inequations describe for each time period the capacity of each technology that may be installed, the flow of energy through them, and the production of electricity, heat, and fuel products or energy services. There are essentially seven types of variables and fourteen principal types of inequations. The merits of such models are discussed, using as illustrations some of the results of the US case. DOE

N82-31812# Little (Arthur D.), Inc., Cambridge, Mass.
DEMONSTRATION OF SCROLL MOTOR ADVANTAGES FOR ULTRA LOW-HEAD HYDROELECTRIC POWER GENERATION Final Report, Sep. 1980 - Nov. 1981
John E. McCullough and John T. Diekmann Feb. 1982 95 p
(Contract DE-FC07-80ID-12202)
(DE82-009792; DOE/ID-12202/T1; C-85464) Avail: NTIS HC A05/MF A01

The potential advantages of an ultra low head hydroelectric power generator utilizing a scroll motor were investigated. The model scroll motor was designed, built, and tested at fluid heads up to 10 ft and speeds up to 270 RPM. The maximum shaft power output of the motor was 400 W. Hydraulic power was converted to shaft power with efficiencies between 30% and 40% with maximum efficiency achieved at a 10 ft head at 175 RPM. Internal leakage losses and friction in the speed increasing gear box as accounting for 50 to 75% of the power losses were identified. Design modifications in the prototype are recommended to reduce these losses. Further efficiency improvements are projected for larger sizes of scroll hydraulic motors. Improvements are recommended for the laboratory model to reduce leakage and speed increaser losses. DOE

N82-31813# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
STATE-OF-THE-ART REVIEW OF LOW-COST COLLECTOR TECHNOLOGIES Final Report
W. A. Tolbert Jun. 1981 13 p refs Prepared in cooperation with Air Force Engineering and Services Center, Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE82-009325; DOE/SSO-4042/2) Avail: NTIS HC A02/MF A01

A brief but concise review is provided of low-cost solar collector technologies and their potential for application within the military. Low-cost, light-weight concepts for flat-plate collectors, parabolic trough collectors, heliostats and parabolic dish collectors are covered. In addition, several criteria are evaluated with respect to low-cost collector technologies. These include reliability, maintainability, survivability, motility/erectibility, environmental impact and economics. Research and development requirements and ongoing activities are also summarized. DOE

N82-31814# Cornell Univ., Ithaca, N. Y. Dept. of Consumer Economics and Housing.
ECONOMIC ANALYSIS OF A PASSIVE SOLAR MULTIPLE FAMILY DWELLING FOR UPSTATE NEW YORK Thesis
J. Laquatra, Jr. Feb. 1982 153 p refs
(Contract W-7405-eng-36)
(DE82-009486; LA-9212-T) Avail: NTIS HC A08/MF A01

The economic feasibility of passive solar energy as applied to a multiple family dwelling in three upstate New York cities, Buffalo, Rochester, and Syracuse was studied. Specifically, two passive solar applications, a Trombe wall and direct gain system, for a nine unit structure were analyzed through the use of a solar economic performance code. City specific data, including climatological information, building construction costs, utility rates, and property taxes were used, as were various economic parameters to reflect economic conditions in general and specifically those of the solar systems' owners. DOE

N82-31815# Brookhaven National Lab., Upton, N. Y.
USE OF GROUND COUPLED TANKS IN SOLAR ASSISTED HEAT PUMP SYSTEMS. 1: COMPARISON OF EXPERIMENTAL AND COMPUTER MODEL RESULTS
P. D. Metz 1982 10 p refs Presented at the ASME Solar Energy Div. 4th Ann. Tech. Conf., Albuquerque, N. Mex., Apr. 1982
(Contract DE-AC02-76CH-00016)
(DE82-009928; BNL-30913; CONF-820410-9) Avail: NTIS HC A02/MF A01

Ground coupling (the use of the Earth as a heat source sink or storage element) for solar assisted heat pump systems was studied. Four buried tank experiments were operated between December, 1978 and March 1981 in order to determine the feasibility of ground coupled tanks in these systems. Heat was added to or removed from the tanks according to a weekly schedule derived from computer simulations of solar heat pump systems in the local (New York) climate. Each tank was operated according to a different control strategy. Experimental results from these tank experiments for this period are presented and these results are compared to those generated by a computer model. The model is found to be valid, for the most part, using undisturbed soil thermal properties which provide the best fit to the data most of the time. Its results are very sensitive to soil thermal conductivity during periods of large heat addition to the tanks. A ground coupled tank is found to be desirable in series solar assisted heat pump systems. However, no important carry over of summer collected heat to winter was observed. DOE

N82-31816# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EXERGY OF THE OCEAN THERMAL RESOURCE AND THE SECOND LAW EFFICIENCY OF IDEALIZED OCEAN THERMAL ENERGY CONVERSION POWER CYCLES
D. H. Johnson Feb. 1982 41 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-009138; SERI/TR-252-1420) Avail: NTIS HC A03/MF A01

A formula is developed to compute the maximum amount of work which can be extracted from a given combined mass of warm and cold ocean water (a quantity called the exergy of the ocean thermal resource). The second law efficiencies of various proposed ocean thermal energy conversion power cycles are compared to determine which best utilizes the exergy of the ocean thermal resource. The second law efficiencies of the multicomponent working fluid cycle, the Beck cycle, and the open and closed single and multiple stage Rankine cycles are compared. These types of OTEC power plants are analyzed in a consistent manner which assumes that all deviations from a plant making use of all the exergy (one with a second law efficiency of 100%) occurs because of irreversible transfer of heat across a finite temperature difference. Conversion of thermal energy to other forms is assumed to occur reversibly. The comparison of second law efficiencies of various OTEC power cycles shows that the multistage Rankine open cycle with just three stages has the potential of best using the exergy of the ocean thermal resource. DOE

N82-31817# Technische Hochschule, Aachen (West Germany). Verkehrswissenschaftliches Inst.
SPECIFIC ENERGY USE IN TRAFFIC. DETERMINATION AND COMPARISON OF SPECIFIC ENERGY CONSUMPTIONS. VOLUME 1: TEXT Final Report [SPEZIFISCHER ENERGIEENSATZ IM VERKEHR ERMITTLUNG UND VERGLEICH DER SPEZIFISCHEN ENERGIEVERBRAEUCHE]
Wulf Schwanhaeusser, Bernd Golling, Werner Simon, H. C. Roesgen, W. Nicoll, W. Schneider, U. Desel, H.J. Radermacher, H. Pohlmann, R. Friedel et al Jul. 1981 327 p refs In GERMAN Sponsored by Bundesministers fuer Verkehr 2 Vol.
(FE-82007/80-Vol-1) Avail: NTIS HC A15/MF A01

The specific energy use by traffic in the Federal Republic of Germany was investigated by refined technical-physical calculation methods. All energetically important influence factors and their interactions were studied, resulting in the calculation model MICSIM. Results were converted into primary energy consumption values. One hundred and twenty seven representative means of transportation were investigated, covering the whole spectrum of the most important modern means of transportation. Author (ESA)

N82-31818# Technische Hochschule, Aachen (West Germany). Verkehrswissenschaftliches Inst.
SPECIFIC ENERGY USE IN TRAFFIC. DETERMINATION AND COMPARISON OF SPECIFIC ENERGY CONSUMPTIONS. VOLUME 2: TABLES [SPEZIFISCHER ENERGIEEINSATZ IM VERKEHR ERMITTLUNG UND VERGLEICH DER SPEZIFISCHEN ENERGIEVERBRAEUCHE]
Wulf Schwanhaeusser 1981 221 p In GERMAN 2 Vol.
(FE-82007/80-Vol-2) Avail: NTIS HC A10/MF A01

The specific energy use by traffic in the Federal Republic of Germany was investigated using refined technical physical calculation methods. All energetically important influence factors and their interactions were systematically studied, resulting in the calculation model MICSIM. Results were converted into primary consumption values. In all, 127 representative means of transportation were investigated, covering the whole spectrum of the most important modern means of transportation. Author (ESA)

N82-31819# Stuttgart Univ. (West Germany). Abteilung Reaktorsicherheit und Umwelt.
ALTERNATIVE DEVELOPMENT POSSIBILITIES OF THE TRANSPORTATION ENERGY DEMAND IN BADEN-WUERTTEMBERG, WEST GERMANY Ph.D. Thesis [ALTERNATIVE ENTWICKLUNGSMOEGLICHKEITEN DES ENERGIEBEDARFS IM BEREICH VERKEHR IN BADEN-WUERTTEMBERG]
Tieu LeVan Aug. 1981 156 p refs In GERMAN
(IKE-K-54-7; ISSN-0173-6892) Avail: NTIS HC A08

The development possibilities of the transportation energy demand in Baden-Wuerttemberg were qualitatively and quantitatively investigated using a traffic model, in order to serve as a basis for transportation strategy and structuring. The traffic model was set up using established hypothetical interactions and statistical data on traffic. In order to quantize the model equations regression analysis was used. The impact of technological and economic developments on traffic and energy demand is discussed.
Author (ESA)

N82-31820# Stuttgart Univ. (West Germany). Abteilung Reaktorsicherheit und Umwelt.
CALCULATION OF THE FINAL ENERGY DEMAND FOR THE FEDERAL REPUBLIC OF GERMANY WITH THE SIMULATION MODEL MEDEE-2 [DIE BESTIMMUNG DES ENERGIEBEDARFS DER BUNDESREPUBLIK DEUTSCHLAND MIT HILFE DES SIMULATIONSMODELLS MEDEE-2]
Ulrich Loeffler and Heinz Weible Aug. 1981 82 p refs In GERMAN; ENGLISH summary
(IKE-K-66; ISSN-0173-6892) Avail: NTIS HC A05/MF A01

The final energy demand for the Federal Republic of Germany was calculated. The model MEDEE-2 describes, in relationship to a given distribution of the production of single industrial sectors, of energy specific values and of population development, the final energy consumption of the domestic, service industry and transportation sectors for a given region. The input data, consisting of constants and variables, and the proceeding, by which the projections for the input data of single sectors are performed, are discussed. The results of the calculations are presented and are compared. The sensitivity of single results in relation to the variation of input values is analyzed. Author (ESA)

N82-31821# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Research and Testing Dept.
DEVELOPMENT OF A REVERSE-RANKINE CYCLE HEAT PUMP FOR SPACE USE: DESIGN AND TESTING OF THE ENGINEERING MODEL OF THE VAPOR COMPRESSOR Final Report
F. Berner, H. Oesch, and K. Goetz Sep. 1981 80 p refs
(Contract ESA-4094/79/NL-AK(SC))
(F+W-FO-1568; ESA-CR(P)-1590) Avail: NTIS HC A05/MF A01

An installation for testing a vapor compressor under operating conditions in a heat pump loop, and the testing of the vapor compressor in this installation are described. The installation is a closed freon 12 loop, like that of a reverse Rankine cycle heat pump. It is demonstrated that the compressor operates satisfactorily under the most extreme conditions, including ingestion of liquid refrigerant during high speed operation, and operation of the compressor in different attitudes. It is shown that volumetric efficiency and isentropic compression efficiency are practically dependent on the compression ratio only, and are rather high for this size of compressor. A heat pump incorporating the vapor compressor cools payloads down to -40C. Maximum cooling rate is over 400W when payload temperature is 10C. Compressor power consumption never exceeds 120W. Author (ESA)

N82-31822# Science Applications, Inc., La Jolla, Calif.
ENERGY EFFICIENCY IMPROVEMENT OF RESIDENTIAL AND COMMERCIAL GAS APPLIANCES, PHASE 2 Final Report, Dec. 1979 - Jun. 1981
D. L. Peterka, T. C. Larson, and R. C. Erickson Jan. 1982 159 p refs
(Contract GRI-5011-345-0095)
(PB82-169681; SAI-444-81-202-LJ; GRI-81/0014) Avail: NTIS HC A08/MF A01 CSCL 10A

A preliminary market survey was conducted which included retailers, consumers, and manufacturers of commercial water heaters. The major goals of the survey were to determine acceptable cost increments, payback periods, add marketing avenues, as well as to determine the current attitudes about commercial water heaters. A parametric market penetration model was also developed to predict market shares as a function of payback period and first cost premiums. The model accounts for consumer behavior as determined from the surveys as well as the barriers identified. GRA

N82-32287# Joint Publications Research Service, Arlington, Va.
PROSPECTS FOR POWER ENGINEERING IN SPACE
V. S. Avduyevskiy, S. D. Grishin, L. V. Leskov, V. K. Ablekov, and A. F. Yevich *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 62-70 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 6, Nov. - Dec. 1981 p 2-6 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32294# Joint Publications Research Service, Arlington, Va.
PLAN FOR EXTENSIVE ENERGY PROJECT WITH FORTY WINDMILLS
In its West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 15-16 Transl. into ENGLISH from NRC Handelsblad (Netherlands), 1 Mar. 1982 p 3 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

N82-32295# Joint Publications Research Service, Arlington, Va.
DANISH-SWEDISH WINDPOWER COMPANY FOUNDED IN DENMARK
Mikael Holmstrom *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 17-18 Transl. into ENGLISH fom Y Tek. (Sweden), 4 Feb. 1982 p 3 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

N82-32296# Joint Publications Research Service, Arlington, Va.
BELGIUM, FRG UNDERGROUND COAL GASIFICATION PROJECT
Lode Willems *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 19-22 Transl. into ENGLISH from Kneck (Belgium), 24 Feb. 1982 p 58-59 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-31823# Hawaii Inst. of Marine Biology, Honolulu. Oceanic Inst.

PLUME SURVEY OTEC-1 MIXED-WATER DISCHARGE, APRIL 11-12, 1981

Edward K. Noda (Noda (Edward K.) and Associates), Paul K. Bienfang, William J. Kimmerer, and Ted W. Walsh May 1981 120 p Prepared for California Univ., Berkeley. Lawrence Berkeley Lab.

(Contract W-7405-eng-48)

(LBL-12951) Avail: NTIS HC A06/MF A01

A shipboard measurement program to provide baseline biological, chemical, and physical oceanographic data at potential OTEC sites is discussed. Results of a plume survey to assess the environmental effects of the mixed water discharge from the OTEC-1 system are described. Author

N82-31824*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CHEMICAL KINETICS AND PHOTOCHEMICAL DATA FOR USE IN STRATOSPHERIC MODELING: EVALUATION NUMBER 5

W. B. DeMore 15 Jul. 1982 193 p refs

(Contract NAS7-100)

(NASA-CR-169262; JPL-Pub-82-57; NAS 1.26:169262) Avail: NTIS HC A09/MF A01 CSCL 13B

Sets of rate constants and photochemical cross sections compiled which were evaluated. The primary application of the data is in the modeling of stratospheric processes on the ozone layer and its possible perturbation by anthropogenic and natural phenomena are emphasized. E.A.K.

N82-31825*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

STS-3 INDUCED ENVIRONMENT CONTAMINATION MONITOR (IECM): QUICK-LOOK REPORT

E. R. Miller, ed. and J. A. Fountain, ed. Jun. 1982 50 p refs

(NASA-TM-82489; NAS 1.15:82489) Avail: NTIS HC A03/MF A01 CSCL 13B

The STS-3/Induced Environment Contamination Monitor (IECM) mission is described. The IECM system performance is discussed, and IECM mission time events are briefly described. Quick look analyses are presented for each of the 10 instruments comprising the IECM on the flight of STS-3. Finally, a short summary is presented and plans are discussed for future IECM flights, and opportunities for direct mapping of Orbiter effluents using the Remote manipulator System. Author

N82-31826# Sandia Labs., Albuquerque, N. Mex.

ASSURING ACCEPTABLE LEVELS OF PROTECTION FROM ENVIRONMENTAL SAFETY AND HEALTH HAZARDS

C. A. Trauth, Jr. 1981 30 p refs Presented at Natl. Safety Congr., Chicago, 21 Oct. 1981

(Contract DE-AC04-76DP-00789)

(DE82-002551; SAND-81-2399C) Avail: NTIS HC A03/MF A01

A summary is presented of the results of a systems research effort to develop a management system for administering environmental, safety and health programs that provides assurance (credible evidence) that positive steps are being taken to limit risk to levels acceptable to those at risk. The management approach discussed here is adapted from proven approaches in other fields and offers, for the first time, a management system in which environmental safety and health accountability is on a par with modern fiscal accountability. DOE

N82-31827# Miljoestyrelsen, Roskilde (Denmark). Luftforurening-slab.

AIR POLLUTION: PROBLEMS AND SOLUTIONS

Jes Fenger May 1981 59 p refs In DANISH

(DE82-900847; MST-LUFT-A-46) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

A survey of the abatement problems of air pollution and some proposed general solutions are presented. The main topics discussed are: strategies, tactics, techniques standard settings and transboundary transport. Typical pollutants are discussed which proved to be unremovable by one universal procedure. Air pollution is one of many cases of man environment interaction. Examples of cost benefit analysis applied to environmental planning are considered. DOE

N82-31828# New York State Energy Research and Development Authority, New York.

CUMULATIVE ENVIRONMENTAL IMPACTS OF COAL CONVERSION

Dec. 1981 392 p refs

(DE82-901166; NYSERDA-81-29) Avail: NTIS HC A17/MF A01

The conversion of eight oil-fired power plants to coal and the construction of six new coal-fired power plants by 1994, were proposed as part of the State Energy Master (SEMP). The potential cumulative environmental impacts associated with implementing this plan are presented. The general conclusions from this report and a summary of major findings by topics follow. The entire plan could be implemented without causing significant adverse cumulative environmental effects, providing that appropriate mitigation measures and coordinated planning take place as required. The greatest potential for adverse cumulative effects would be in the New York City Metropolitan Area. The issues of potential concern are air quality, combustion wastes disposal, and transportation. Minor impacts, primarily of a site-specific nature, would occur. A variety of mitigation measures are available to control these impacts adequately. DOE

N82-31829# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.

INEXPENSIVE PERFLUOROCARBON TRACER TECHNIQUE FOR WIDE-SCALE INFILTRATION MEASUREMENTS IN HOMES

Russell N. Dietz, Edgar A. Cote, Gunnar I. Senum, and Robert F. Wieser Aug. 1981 8 p refs Presented at the Intern. Symp. on Indoor Air Pollution, Health and Energy Conservation, Amherst, Mass., 13-16 Oct. 1981

(Contract DE-AC02-76CH-00016)

(DE82-000142; BNL-30032; CONF-811048-1) Avail: NTIS HC A02/MF A01

A perfluorocarbon tracer technique to determine infiltration rates in homes is described. A tracer kit, which can be deployed by the average homeowner, is briefly described. The tracer source is a fluoroelastomer plug impregnated with a known mass of perfluorocarbon tracers (PFT) and crimped within a metal shell. The PFT diffuses from the end of the plug. Two samplers briefly described are: the capillary adsorption tube sampler (CATS) and the programmable Brookhaven atmospheric tracer sampler (BATS). Development of one of the diffusion sources in a home and use of a BATS unit to measure the increase in the tracer concentration perfluor dimethyl cyclohexane are discussed. DOE

N82-31830# California Univ., Livermore. Lawrence Livermore Lab.

TECHNOLOGY ASSESSMENT: ENVIRONMENTAL, HEALTH, AND SAFETY IMPACTS ASSOCIATED WITH OIL RECOVERY FROM US TAR-SAND DEPOSITS

J. I. Daniels, L. R. Anspaugh, and Y. E. Ricker 13 Oct. 1981 146 p refs

(Contract W-7405-eng-48)

(DE82-003756; UCRL-53210) Avail: NTIS HC A07/MF A01

Data were extrapolated to determine pollutant levels expected from conceptual commercial surface and in situ facilities producing 20,000 bbl/d of recovered oil. The likelihood-of-occurrence of these impacts was then assessed. Experience from other industries, includin information concerning heath and ecosystem damage from air pollutants, measurements of ground-water transport of organic pollutants, and the effectiveness of environmental-control technologies was used to make the assessment. DOE

N82-31831# Swedish Water and Air Pollution Research Lab., Goeteborg.

STRESS IN ECOSYSTEMS

Arne Jerneloev and Ulf Wahlgren Mar. 1981 13 p refs

(DE82-901366; IVL-B-599) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A stress concept which relates to energy flows through ecosystems is suggested. The need of quantifying of responses to external pressure is pointed out. The efficiency of the systems is defined as the degree of utilization of the available energy, and these factors are used for definitions of stress. The concepts are visualized in quantities obtained from simple Lotka-Volterra type equations. DOE

N82-31832# California Univ., Los Angeles.
ENVIRONMENTAL EFFECTS OF SOLAR THERMAL POWER SYSTEMS: EXPERIMENTS ON RESTORATION OF DISTURBED DESERT LAND BY MEANS OF REVEGETATION Progress Report, FY 1981
E. M. Romney, R. B. Hunter, and A. Wallace Oct. 1981 18 p refs
(Contract DE-AM03-76SF-00012)
(DE82-006231; UCLA-12/1312) Avail: NTIS HC A02/MF A01

Cost effective methods of restoring native vegetation on disturbed Mojave Desert land were developed. Techniques for producing transplanting stocks of native shrub species were emphasized and different ways to protect and encourage regrowth from crown and root sprouting and new seedling establishment were investigated. Improved transplanting methods were developed. Vegetation management and recovery are required at sites disturbed for solar thermal power system installations. DOE

N82-31833# California Univ., Livermore. Lawrence Livermore Lab.
AIR-QUALITY-MODEL UPDATE
J. E. Penner and J. J. Walton 15 Jan. 1982 56 p refs
(Contract W-7405-eng-48)
(DE82-007145; UCID-19300) Avail: NTIS HC A04/MF A01

The Livermore Regional Air Quality Model (LIRAQ) was improved. The changes that were made in chemistry, species treatment, and boundary conditions are described. Smog chamber simulations used to verify the chemistry as well as simulations of the entire air quality model for two prototype days in the Bay Area are reported. The results for the prototype day simulations are due to the need for improvement in meteorology fields, but they show the dependence and sensitivity of high hour ozone to changes in selected boundary and initial conditions. DOE

N82-31834# Tennessee Valley Authority, Chattanooga. Office of Natural Resources.
PRODUCTION OF SULFATE AEROSOLS IN THE PLUME OF A COAL-FIRED POWER PLANT UNDER NORMAL AND REDUCED PRECIPITATOR OPERATION
J. F. Meagher, E. M. Bailey, and L. Stockburger, III Dec. 1981 34 p refs
(DE82-901919; TVA/ONR/ARP-82/6) Avail: NTIS HC A03/MF A01

The effect of primary aerosol on sulfate aerosol production was examined. Plumes were measured by using an instrumented helicopter and flue gas analyses which were performed on each of the two stacks. The plume particle loading was increased during four of the experiments through a reduction in the electrostatic precipitator (ESP) capacity. The relatively high nighttime rates were measured just after sunset and may result from delayed reactions of free radical precursors which were produced during the daylight hours. It is indicated that a region of rapid SO2 oxidation must exist for the first minutes after the flue gas is emitted from the stacks and the difference between extrapolated intercepts from aircraft measurements and flue gas sampling. DOE

N82-31835# Oak Ridge National Lab., Tenn.
SYMPOSIUM ON INTERMEDIATE-RANGE ATMOSPHERIC-TRANSPORT PROCESSES AND TECHNOLOGY ASSESSMENT
Oct. 1981 455 p refs Symp. held at Gatlinburg, Tenn., 1 Oct. 1980
(Contract W-7405-eng-26)
(DE82-000889; CONF-801064) Avail: NTIS HC A20/MF A01

Studies of air pollution transport are given. Emphasis is placed on the modeling of atmospheric transport processes. DOE

N82-31836# Battelle Pacific Northwest Labs., Richland, Wash.
HANFORD 200 EAST AREA AMBIENT NO/SUB x/CONCENTRATIONS, FEBRUARY 1968 THROUGH FEBRUARY 1969
J. V. Ramsdell Sep. 1981 24 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001418; PNL-3996) Avail: NTIS HC A02/MF A01

Ambient concentrations of oxides of nitrogen were measured in the vicinity of the 200 East Area of Hanford from late February 1968 through February 1969. An analysis of the complete set to document the ambient concentrations during time periods when the Purex Plant was emitting nitrogen oxides is given. It is intended to represent either current ambient nitrogen oxide/concentrations or concentrations during Purex Plant operation in the future. However, it does provide a reference for use in comparison of ambient nitrogen oxide/concentrations during future periods of Purex emissions with those occurring in past periods. It is also of interest to compare the annual average concentrations estimated from the measurements with the national primary ambient air quality standard for nitrogen oxide, which is 50 parts per billion annual arithmetic mean (National primary and secondary ambient air quality standard for nitrogen dioxide, 1971). DOE

N82-31837# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
MEASUREMENT OF Kr-85 CONCENTRATIONS IN AIR USING A CRYOGENIC SAMPLING TECHNIQUE
M. E. Owens, B. A. Berven, and P. T. Perdue 1981 11 p refs Presented at the 25th Conf. on Anal. Chem. and Nucl. Technol., Gatlinburg, Tenn., 6 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001475; CONF-811025-11) Avail: NTIS HC A02/MF A01

A method to detect moderate concentrations (down to approximately 370 Bq cu m under actual field conditions) of Kr-85 in air was developed. This method employs a cryogenic sampler for collection of the air sample of interest and a Ge(Li) spectroscopy system to determine the concentration of Kr-85 by detection of the 514 keV gamma photon. DOE

N82-31838# Department of Atomic Energy, Bombay (India).
SECOND SPECIAL SYMPOSIUM ON NATURAL RADIATION ENVIRONMENT
1981 187 p refs Symp. Held at Bombay, 19-23 Jan. 1981 Prepared in cooperation with Indian Association for Radiation Protection, Bombay
(INIS-mf-6530; CONF-810153) Avail: NTIS (US Sales Only) HC A09/MF A01; DOE Depository Libraries

A wide range of geological radioactive anomalies is discussed. Emphasis is placed on the effort to locate and describe the characteristics of areas of high natural radioactivity. Topics covered include: analysis of Ra-226 and other heavy radionuclides in samples of food and water and environmental radon studies and the incidence of radon, thorium, and uranium in biological tissues. J.M.S.

N82-31839# Los Alamos Scientific Lab., N. Mex.
MODIFICATION OF THE UPPER ATMOSPHERE WITH CHEMICALS FOUND IN ROCKET EXHAUST
Paul A. Bernhardt, John Zinn, Michael Mendillo (Boston Univ., Mass.), and Jeff Baumbardner (Boston Univ., Mass.) 1982 11 p refs Presented at the AIAA 20th Aerospace Sci. Meeting, Orlando, Fla., 11-12 Jan. 1982
(Contract W-7405-eng-36)
(DE82-010411; LA-UR-82-61; CONF-820106-4) Avail: NTIS HC A02/MF A01

Rockets, burning above 200 km altitude, release exhaust vapors which react chemically with the plasma comprising the F-region ionosphere. The two major types of atmospheric modification produced by rocket exhaust are: (1) the formation of large scale ionospheric holes, and (2) the enhancement of the airglow emissions. The ionospheric holes are regions tens of kilometers in diameter where the plasma concentration can be reduced by a factor of ten or more. Plasma instabilities may produce irregularities at the edges of the holes. Communication and navigation systems

relying on radio propagation through the modified ionosphere may be affected. Airglow enhancements are a result of excited neutral species being produced by chemical reactions between the rocket exhaust and the ionospheric plasma. For example, the 630 nm line from atomic oxygen may increase twenty-fold in intensity over the ambient level. This paper reviews experimental observations and theoretical treatments of ionospheric modification produced by gas releases in the upper atmosphere. Recent experimental measurements of the ionospheric modification by an ATLAS-F launch vehicle are presented. The plans for future experiments are discussed. Author

N82-31840# California Univ., Livermore. Lawrence Livermore Lab.
FIRST DETECTION OF CARBON DIOXIDE EFFECTS: WORKSHOP SUMMARY
M. C. MacCracken and Harry Moses (DOE, Washington, D.C.) Feb. 1982 41 p refs Workshop held in Harpers Ferry, W. Va., 8-10 Jun. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE82-009340; UCRL-87302; CONF-8106214-1) Avail: NTIS HC A03/MF A01

A research strategy is discussed that would provide the basis for early identification of the expcted CO2-induced response so that model projections of a warmer climate and of impacts on the biosphere can either be confirmed, rejected, or modified. A three-part strategy was developed requiring determination of whether a climate or biospheric change has occurred, consideration of the role of other factors that might contribute to or mask the O2-induced response, and isolation of the climatic and biospheric response to increasing CO2 concentrations. This third task is to be accomplished by statistical analysis of a CO2-specific set of climate and biospheric parameters that must respond together as theoretically predicted if CO2 is to judged as the most probable causal factor. DOE

N82-31841# Atmospheric Turbulence and Diffusion Lab., Oak Ridge, Tenn. Atmospheric Turbulence and Diffusion Lab.
HANDBOOK ON ATMOSPHERIC DIFFUSION
Steven R. Hanna, Gary A. Briggs, and Rayford P. Hosker, Jr. 1982 107 p refs
(DE82-002045; DOE/TIC-11223) Avail: NTIS HC A06/MF A01

Basic meteorological concepts are covered, as well as plume rise, source effects, and diffusion models. Cooling tower plumes and urban diffusion are discussed. Suggestions are given for calculating diffusion in special situations, such as for instantaneous releases over complex terrain, over long distances, and during times when chemical reactions or dry or wet deposition are important. DOE

N82-31842# California Univ., Livermore. Lawrence Livermore Lab. Mathematics and Statistics Div.
STIFF-SYSTEM PROBLEMS AND SOLUTIONS AT LLNL
Alan C. Hindmarsh Mar. 1982 25 p refs Presented at the Intern. Conf. on Stiff Computation, Park City, Utah, 12-14 Apr. 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-009393; UCRL-87406; CONF-820425-2) Avail: NTIS HC A02/MF A01

Difficult stiff system problems are typified by those arising from various atmospheric kinetics models, which include reaction kinetics and transport in up to two space dimensions. Approaches devised for these problems resulted in several general purpose stiff system solvers. These have since evolved into a new systematized collection of solvers, called ODEPACK, based on backward differentiation formulas in the stiff case. A model kinetics transport problem illustrates the various solvers. DOE

N82-31843# Department of Energy, Washington, D. C.
ENVIRONMENTAL ASSESSMENT: DEPARTMENT OF ENERGY FINANCIAL INCENTIVES FOR PRODUCTION OF UP TO 60, 000 BARRELS PER DAY OF ETHANOL
Nov. 1981 138 p refs
(DE82-010683; DOE/EA-0140) Avail: NTIS HC A07/MF A01

This environmental assessment evaluates all phases of fuel ethanol production and use and compares program alternatives. It is expected that the production and use of 60,000 bbl/d of ethanol should produce no major environmental effects. Environmental residuals, health and safety concerns, and institutional issues associated with the conversion, distribution, and end use of ethanol are all emenable to control or mitigation through currently available techniques or solutions. Additional production of feedstocks to meet the 60,000 bbl/d goal raises the most concern, but the amount of new cropland required appears to be manageable from an environmental perspective. As a result, no insurmountable environmental impacts are expected from the ethanol production goal of 60,000 bbl/d. DOE

N82-31844# Brookhaven National Lab., Upton, N. Y. Div. of Energy and Economic Analysis.
INFLUENCE OF SOLAR ENERGY DEPLOYMENT ON LONG-RANGE TRANSPORT AIR POLUTION
F. W. Lipfert and L. I. Kleinman Jul. 1981 35 p refs
(Contract DE-AC02-76CH-00016)
(DE82-011329; BNL-51350) Avail: NTIS HC A03/MF A01

An analysis of the effects on ambient sulfur oxides of widespread deployment of various solar energy technologies by the year 2000 has been made, using the BNL long-range transport model AIRSOX. The solar energy deployment scenario was based on the Domestic Policy Review (National Energy Plan II), as supplied by the MITRE Corporation as part of the Technology Assessment of Solar Energy (TASE) project. The resulting changes in SO/sub x/ are in general quite modest (less than 10%), which is a direct result of the modest changes in SO2 emissions resulting from solar energy use. The changes over time from 1975 to 2000 are in general more important, and imply that a solar energy scenario specifically intended to optimize air quality might result in larger benefits. DOE

N82-31845# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
PRELIMINARY GEOTHERMAL DISPOSAL CONSIDERATIONS, STATE HEALTH LABORATORY, BOISE, IDAHO
I. A. Engen Feb. 1982 13 p
(Contract DE-AC07-76ID-01570)
(DE82-008328; EGG-GTH-5521) Avail: NTIS HC A02/MF A01

The state of Idaho has converted its public Health and Agriculture Laboratory Building to geothermal space heating to take advantage of the opportunity for lower assessment and the resulting economic benefit. Preliminary considerations regarding geothermal effluent disposal are presented. It was concluded that disposal of the effluent to the Boise River or to an irrigation canal would require a mechanism such as a spray cooling pond to cool the effluent prior to discharge. DOE

N82-31846# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Werkstofftechnologie und Chemie.
MONITOR: A MEASURING SYSTEM FOR THE RECORDING OF HYDROGRAPHIC AND CHEMICAL DATA IN ESTUARIES AND COASTAL WATERS
F. Schroeder, H. H. Kock, and P. H. Koske 1981 40 p refs In GERMAN; ENGLISH summary
(DE82-901926; GKSS-81/E/14) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Because of the hydrographic complexity of estuaries the monitoring of coastal waters presents certain problems. Therefore the monitoring system was directed especially to the unique situation in estuaries. The survey system MONITOR consists of five components. The central unit is a survey vessel with an analytical flow-through system and a digital shipboard computer. Analyses with more sophisticated analytical requirements are performed in a mobile laboratory or in a land labortory. In addition an aircraft equipped with a remote sensing package and a small motorboat with portable instruments is integrated into the survey system. These five components can be applied to different combinations just as the circumstances require. DOE

N82-31847# Environmental Research and Technology, Inc., Westlake Village, Calif.
PARTICLE SAMPLING AND ANALYSIS IN THE CALIFORNIA SAN JOAQUIN VALLEY Final Report, Jul. 1978 - Jul. 1980
Steven L. Heisler and Ronald Basket (Comp, Dresser and McKee) Dec. 1981 277 p refs
(Contract ARB-A7-168-30)
(PB82-164369; ARB-R-81/153; P-5381-701) Avail: NTIS HC A13/MF A01 CSCL 07D

An exploratory aerosol characterization program was conducted. The results of the aerosol study indicate that the particulate matter sampled during short periods of the winter 1978 and summer and fall 1979 were dominated by soil dust, sulfate, nitrate and carbon. Sulfate concentration and carbon were reasonably uniform through the months and locations sampled, but there was significantly more nitrate found in winter than in the summer. Some evidence for enrichment in ammonium was found in the aircraft data. The contributions of source to particle samples were estimated by the chemical element balance method. Blowing dust from cultivated and uncultivated land, unidentified carbon sources, and material from atmospheric chemical reactions (ammonium sulfate and nitrate) accounted for most of the material collected. GRA

N82-31848# Coastal Environments, Inc., Baton Rouge, La.
AN INTRODUCTION TO THE ENVIRONMENTAL LITERATURE OF THE MISSISSIPPI DELTAIC PLAIN REGION
Johannes L. vanBeek, Donny J. Davis, Rod E. Emmer, S. A. Hsu, Irving A. Mendelssohn, Dugan S. Sabins, Charles L. Wax, Karen M. Wicker, James B. Johnston, and Martha W. Young Oct. 1981 213 p refs Sponsored in part by the Bureau of Land Management
(PB82-161621; FWS-OBS-79/30) Avail: NTIS HC A10/MF A01 CSCL 13B

Selected environmental literature of the Mississippi Deltaic Plain Region is reviewed. This review introduces some of the major ecosystem components and processes, describes oil and gas production activities, and guides the reader to available literature. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N82-31849*# Hampton Inst., Va. Dept. of Physics and Engineering Studies.
LOCAL EFFECTS OF PARTLY-CLOUDY SKIES ON SOLAR AND EMITTED RADIATION Annual Report, 1 Aug. 1981 - 31 Jul. 1982
D. A. Whitney and D. D. Venable 31 Jul. 1982 100 p refs
(Grant NAG1-87)
(NASA-CR-169272; NAS 1.26:169272) Avail: NTIS HC A05/MF A01 CSCL 04A

A computer automated data acquisition system for atmospheric emittance, and global solar, downwelled diffuse solar, and direct solar irradiances is discussed. Hourly-integrated global solar and atmospheric emitted radiances were measured continuously from February 1981 and hourly-integrated diffuse solar and direct solar irradiances were measured continuously from October 1981. One-minute integrated data are available for each of these components from February 1982. The results of the correlation of global insolation with fractional cloud cover for the first year's data set. A February data set, composed of one-minute integrated global insolation and direct solar irradiance, cloud cover fractions, meteorological data from nearby weather stations, and GOES East satellite radiometric data, was collected to test the theoretical model of satellite radiometric data correlation and develop the cloud dependence for the local measurement site. R.J.F.

N82-31850*# Marquette Univ., Milwaukee, Wis. Dept. of Mechanical Engineering.
FEASIBILITY OF OBSERVER SYSTEM FOR DETERMINING ORIENTATION OF BALLOON BORNE OBSERVATIONAL PLATFORMS Final Report
N. J. Nigro and J. C. Gagliardi May 1982 120 p refs
(Grant NAG1-65)
(NASA-CR-169275; NAS 1.26:169275) Avail: NTIS HC A06/MF A01 CSCL 04A

An observer model for predicting the orientation of balloon borne research platforms was developed. The model was employed in conjunction with data from the LACATE mission in order to determine the platform orientation as a function of time. Author

N82-31851# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LONGITUDINAL DIFFERENCES IN THE CHARACTERISTICS OF SPREAD F OCCURRENCE RATES ALONG THE LONGITUDE OF THE AMERICAN CONTINENT AND ITS IMPLICATIONS FOR THE DYNAMIC MECHANISM OF THE F REGION [DIFERENCAS LONGITUDINAIS NAS CARACTERISTICAS DA CAMADA F DISPERSA, NA LONGITUDE DO CONTINENTE AMERICANO, E SUAS IMPLICACOES NO MECANISMO DINAMO DA REGIAO F]
Mangalathayil Ali Abdu, Jose August Bittencourt, and Inez Staciarini Batista Mar. 1982 16 p refs In PORTUGUESE; ENGLISH summary Sponsored in part by National Fund for Scientific and Technical Development
(INPE-1941-RPE/260) Avail: NTIS HC A02/MF A01

A comparative study is carried out of the spread F occurrence rates at two stations located along the magnetic equator in the American zone. While there are similarities in the gross features of the range type spread F occurrences, profound differences, on a seasonal basis, are present in the case of the frequency type spread F at the two stations. Profound dissimilarities are observed also in evening enhancement in the F region vertical drift velocity (Vz). An attempt is made to interpret these results in terms of the differences in the magnetic field declinations at the two stations that cause significant differences in the conjugate E region sunset durations and, hence, in differing rates of F region polarization electric field developments at these stations. Influence of the F region dynamo on the gross features of the prereversal V sub peak and spread F characteristics seems to be born out in the present results. Author

N82-31852# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A NUMERICAL STUDY OF THE STRUCTURE OF THE RICHARDSON GRID WHEN APPLIED TO THE EQUATIONS OF LONG GRAVITY WAVES [UM ESTUDO NUMERICO DA ESTRUTURA DA GRADE DE RICHARDSON, QUANDO APLICADA AS EQUACOES DAS ONDAS LONGAS DE GRAVIDADE]
Marco Antonio Maringolo Lemes and Yoshihiro Yamazaki Feb. 1982 28 p refs In PORTUGUESE; ENGLISH summary
(INPE-2329-RPE/404) Avail: NTIS HC A03/MF A01

Barotropic oscillations in an incompressible fluid confined in a one-dimensional channel are numerically simulated. The discrepancies between the analytical and numerical solutions for the linear case without bottom topography are discussed. The numerical method is applied (centered differences in space and time, in a Richardson grid) to the nonlinear problem of wave breaking, with and without topography. S.L.

N82-31853# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
POSSIBLE MECHANISMS RELATING ASTEROID IMPACTS TO EXTINCTIONS AND GEOMAGNETIC REVERSALS [POSSIVEIS MECANISMOS QUE RELACIONAM O IMPACTO DE ASTEROIDES, AS EXTINCOES E AS INVERSOES GEOMAGNETICAS]
Daniel Jean Roger Nordemann Mar. 1982 16 p refs In PORTUGUESE; ENGLISH summary Sponsored in part by the Fundo Nacional de Desenvolvimento Cientifico e Technologico (FNDCT)

(INPE-2340-PRE/085) Avail: NTIS HC A02/MF A01

Mechanical processes occurring between the crust and the interior of the Earth, which overcome the difficulty in relating sources of the geomagnetic field dipolar component and shallow asteroid impact effects, and which help to explain some points about the causes of the Earth's magnetic field and its reversals, are discussed. Author

N82-31854# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

INSTALLATION AND CALIBRATION OF A GEOMAGNETIC STATION IN CACHOEIRA PAULISTA [MONTAGEM E CALIBRACAO DE UMA ESTACAO MAGNETO TELUICA EM CACHOEIRA PAULISTA]

Luis Sergio Vieira Dutra, Hugo Fournier (Centre de Recherches Geophysique Lab. de Geomagnetisme), Daniel Jean Roger Nordemann, and Nalin Babulai Trivedi Mar. 1982 16 p refs In PORTUGUESE; ENGLISH summary Sponsored by National Fund for Scientific and Technical Development

(INPE-2337-PRE/084) Avail: NTIS HC A02/MF A01

A magnetotelluric station was installed. Simultaneous measurements of horizontal (X, Y) geomagnetic and geoelectric field variations are called magnetotelluric (MT) measurements. A flux gate magnetometer was used to conduct measurements in the period range from 100 seconds to 86400s and an amplifier was constructed to be able to measure N-S and E-W electric field variations in the same period range. Also MT measurements were done in the period range from 0.1 second to 600 seconds employing an induction magnetometer and an adequate amplifier for magnetic and electric field variations, respectively. The constructional details and electronic circuits used for MT measurements are presented here. Author

N82-31855# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE USE OF VLF PHASE MEASUREMENTS TO ASSOCIATE INCREASED PARTICLE PRECIPITATION IN THE REGION OF THE BRAZILIAN MAGNETIC ANOMALY WITH MAGNETIC STORMS [AUMENTO DA PRECIPITACAO DE PARTICULAS NA REGIAO DA ANOMALIA MAGNETICA BRASILERIRA, ASSOCIADO A TEMPESTADES MAGNETICAS ATRAVES DE MEDIDAS DE FASE EM VLF]

Mangalathayil Ali Abdu, Inez Staciarini Batista, Liliana Rizzo Piazza, and Oswaldo Massambani (Sao Paulo Univ.) Mar. 1982 14 p refs In PORTUGUESE Sponsored in part by the National Fund for Scientific and Technical Development

(INPE-2346-PRE/088) Avail: NTIS HC A02/MF A01

Phase recordings at Atibaia, Brazil, (23 deg S, 46 deg W) of 13.6 KHz VLF signal transmitted from Golfo Nuevo, Argentina (43 deg S, 65 deg W), a trajectory confined almost completely within the South Atlantic anomaly region, show significant perturbations, indicative of the lowering of the VLF reflection level, following the onset of magnetic disturbances. Simultaneous measurements of the E layer parameters, over Cachoeira Paulista (22 deg S, 45 deg W) also show enhancements, with some delay with respect to the magnetic disturbance onset. These results show magnetic storm associated ionization enhancements taking place in a height region from approximately 110 km down to 70 km, which is interpreted as having been produced by precipitation of high energy charged particles in the South Atlantic magnetic anomaly. The results also suggest some degree of day to day variability in the abundance of metallic species, and/or in the dynamics of the E region over this region. S.L.

N82-31856# Naval Postgraduate School, Monterey, Calif.

GENERATION RATE OF MARINE AEROSOLS AS DETERMINED FROM A BOUNDARY LAYER MODEL Technical Report, 10 Jan. 1981 - 30 Sep. 1982

C. W. Fairall (BDM Corp., Monterey, Calif.), Kenneth L. Davidson, and G. E. Schacher May 1982 31 p refs

(AD-A116571; NPS63-82-003) Avail: NTIS HC A03/MF A01 CSCL 04/1

The rate of generation of aerosols by bubbles bursting at the sea surface is not well known. Unfortunately, the rate is a very difficult parameter to measure. The rate can be inferred from a boundary layer model that includes determining evolutions of aerosol spectra from parameterizations of generation, transport, and removal processes. Using this technique, data from CEWCOM-78 have been analyzed to produce the aerosol surface flux volume spectrum from 0.8 to 15 micrometer radius at a wind speed of 9 m/sec. Using this flux spectrum and equilibrium aerosol spectra from JASIN, flux spectra are calculated for wind speeds from 6 to 18 m/sec. Author (GRA)

N82-31857# Naval Postgraduate School, Monterey, Calif.

MIXED LAYER MODELING OF AEROSOLS IN THE MARINE BOUNDARY LAYER

Kenneth L. Davidson, C. W. Fairall (BDM Corp.), and G. E. Schacher Mar. 1982 53 p refs

(SF59551697)

(AD-A116509; NPS63-82-002) Avail: NTIS HC A04/MF A01 CSCL 04/1

A mixed layer dynamic model for the structure and evolution of aerosols in the marine regime is presented. The ambient aerosol spectrum is divided into the continental and sea salt components and transformed to a reference saturation ratio, S = 0.8 (80% relative humidity). The temporal evolution of the aerosol spectrum is predicted from rate equations which require a specification of the surface production rate, the entrainment rate, (W(e)) and the mixed layer depth (h). The model was tested against a marine data set obtained off Southern California during the CEWCOM-78 experiment. The test was with two different methods of obtaining the relevant meteorological and aerosol parameters: (1) actual measurements and (2) dynamic boundary layer model prediction and parameterization. In the first case the model reproduced the aerosol data within a factor of 1.5 while in the second case the uncertainty factor was 2.0. In either case the model only modestly outperforms the much simpler Wells-Munn-Katz (WMK) model, which uses only local specification of the wind speed and humidity. Suggested improvements of the mixed layer model are presented. Author (GRA)

N82-31858# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

GEOPHYSICAL INVESTIGATION OF THE RATON BASIN M.S. Thesis

Richard Stephen Cheney May 1982 90 p refs

(AD-A116738; AFIT/NR-82-6T) Avail: NTIS HC A05/MF A01 CSCL 08/7

This thesis correlates gravity, magnetic, and seismic data for the Raton Basin of Colorado and New Mexico. The gravity data suggest that the study area, and the region around it, is in isostatic equilibrium. The free air anomaly in the southern portion of the study area suggests lack of local compensation due to Quaternary volcanic rock. The volcanic rock thickness, calculated from the free air gravity data, is 180 m. The gravity data indicated a crustal thickness of about 45 km, and the crust thinned from west to east. A basement relief map was constructed from the Bouquer gravity data. Computer techniques were developed to calculate the depth to the basement surface and to plot a contour map of that surface. The Raton Basin magnetic map defined the same surface found on the basement relief map since the overlying sedimentary rocks have no magnetism; therefore, any magnetism present is caused by the basement rock. A seismic survey near capulin Mountain detected a high level of microseismicity that may be caused by adjustment along faults or dormant volcanic activity. Author

N82-31859# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

MULTI-DIMENSIONAL SPECTRAL ESTIMATION FOR UNEQUALLY SPACED DATA Final Progress Report, 1 Apr. 1981 - 30 Jun. 1982

J. H. McClellan 28 Jun. 1982 4 p refs

(Contract DAAG29-81-K-0073)

(AD-A116430; ARO-18030.3-EL) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research has been carried out in two areas: first, the extension of Pisarenko's method to multidimensional (m-D) signals and arrays; second, the extension of the maximum entropy method (MEM) to non-uniformly sampled m-D signals and arrays. Most of this work has been of a theoretical nature. Author (GRA)

N82-31860# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
TEST OF A NEW MODEL OF FRACTURED ROCK Final Report, 1 May 1981 - 30 Apr. 1982
J. B. Walsh and W. F. Brace 30 May 1982 10 p
(Contract DAAG29-79-C-0032)
(AD-A116558; ARO-16319.3-GS) Avail: NTIS HC A02/MF A01 CSCL 08/7

The purpose of this program was to study theoretically and experimentally how fluid permeability and electrical resistivity are related to porosity. Also, we proposed to study how these properties change with fluid pressure and confining pressure for the purpose of establishing a law of effective stress for these processes. GRA

N82-31861# Idaho National Engineering Lab., Idaho Falls.
RAFT RIVER GEOSCIENCE CASE STUDY, VOLUME 1
M. R. Dolenc, Laurence C. Hull, Steve A. Mizell, Brent F. Russell, Piotr A. Skiba, Jon A. Strawn, Julie A. Tullis, and Reeta Garber, ed. Nov. 1981 160 p refs
(Contract DE-AC07-76ID-01570)
(DE82-003355; EGG-2125-Vol-1) Avail: NTIS HC A08/MF A01

The Raft River Geothermal Site has been evaluated over the past eight years by the United States Geological Survey and the Idaho National Engineering Laboratory as a moderate-temperature geothermal resource. The geoscience data gathered in the drilling and testing of seven geothermal wells suggest that the Raft River thermal reservoir is: (1) produced from fractures found at the contact metamorphic zone apparently the base of detached normal faulting from the Bridge and Horse Well Fault zones of the Jim Sage Mountains; (2) anisotropic, with the major axis of hydraulic conductivity coincident to the Bridge Fault Zone; (3) hydraulically connected to the shallow thermal fluid of the Crook and BLM wells based upon both geochemistry and pressure response; (4) controlled by a mixture of diluted meteoric water recharging from the northwest and a saline sodium chloride water entering from the southwest. Although the hydrogeologic environment of the Raft River geothermal area is very complex and unique, it is typical of many Basin and Range systems. DOE

N82-31862# Los Alamos Scientific Lab., N. Mex.
INTERPRETATION OF ELECTRICAL CONDUCTIVITY IN THE LOWER CRUST
K. A. Kariya and T. J. Shankland Jan. 1982 49 p refs
(Contract W-7405-eng-36)
(DE82-010906; LA-9050-MS) Avail: NTIS HC A03/MF A01

Values of electrical conductivity of possible lower crustal materials to interpretate lower crustal magnetotelluric soundings were studied. Two groups of physical conditions that can enhance electrical conduction in the crust at depths of 15 to 30 km are discussed: (1) a hot, dry regime obtained in regions of high heat flow or at intermediate depths; and (2) a warm, wet regime suitable to explain high lower crustal conduction in regions for which high temperatures are not expected. Statistically significant differences between rock types are found: mafic rocks are better conductors than granites by about half an order of magnitude and within the mafic group, aphanitic rocks have higher conductivity than phaneritic ones. Plots of log conductivity vs temperature are presented for each rock type to show mean log conductivity values together with standard deviations so that most probable temperature ranges can be inferred from conductivity. The use of this information is to infer temperature for a high conductivity layer at 15 to 25 km depth in the Zuni Area of New Mexico is demonstrated. DOE

N82-31863# Sandia Labs., Albuquerque, N. Mex. Systems Research Div.
COMPARISON OF SEISMIC-EVENT-DETECTION ALGORITHMS
S. K. Fletcher Jan. 1982 26 p refs
(Contract DE-AC04-76DP-00789)
(DE82-010933; SAND-81-2630) Avail: NTIS HC A02/MF A01

Several algorithms were considered for use in real time detection of regional seismic events in seismic background noise. Four detectors were implemented and are compared against one another for detection ability, false alarms, and execution speed. Test data were manufactured for this comparative study by superimposing on a typical seismic background several scaled down events representative of the variety of event types in the regional detection problem. DOE

N82-31864# Los Alamos Scientific Lab., N. Mex.
PRELIMINARY STRATIGRAPHIC AND PETROLOGIC CHARACTERIZATION OF CORE SAMPLES FROM USW-G1, YUCCA MOUNTAIN, NEVADA
A. C. Waters, ed. and P. R. Carroll, ed. Nov. 1981 69 p refs
(Contract W-7405-eng-36)
(DE82-010985; LA-8840-MS) Avail: NTIS HC A04/MF A01

The potential for long term storage of radioactive waste were investigated. Hole USW-G1 was drilled to a depth of 6000 ft below the surface, in the central part of the Yucca Mountain area, Nevada. Petrographic study of the USW-G1 core is presented and shows the tuffs are partly recrystallized to a variety of secondary minerals. Iijima's zeolite zones 1 through 4 of burial metamorphism are recognized in the core. Analcime persists, either metastably or as a retrograde mineral, deeper in the core. The oxidation state of Fe-Ti oxide minerals, through most of the core, increases as the degree of welding decreases, but towards the bottom of the hole, reducing conditions generally prevail. Four stratigraphic units transected by the core are potentially favorable sites for a waste repository. The four units are: (1) the lower cooling unit of the Topopah spring member; (2) cooling unit of the Bullfrog member; (3) the upper part of the Tram tuff; and (4) the Lithic rich tuff. DOE

N82-31865*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL SIMULATION OF THE MAGNETOSPHERIC GATE MODEL FOR X-RAY BURSTERS
Sumner G. Starrfield (Arizona State Univ., Temple), S. Kenyon (Illinois Univ., Urbana), J. W. Truran (Illinois Univ., Urbana), and W. M. Sparks 1981 5 p refs Presented at the Conf. on Gamma-Ray Bursters, La Jolla, Calif., 5 Aug. 1981
(Contract W-7405-eng-36)
(NASA-TM-84712; NAS 1.15:84712; DE82-000581; LA-UR-81-2685; CONF-810871-3) Avail: NTIS HC A02/MF A01

A Lagrangian, fully implicit, one dimensional hydrodynamic computer code was used to investigate the evolution of a gas cloud impacting the surface of a 20 km, 1 Msub solar neutron star. This gas is initially at rest with respect to the surface of the neutron star, extends to 185 km above the surface, and is optically thick. The infall results in a burst which lasts about 0.1 seconds and reached a peak luminosity and effective temperature of 240,000 Lsub solar and 9 million; respectively. The burst was followed by a phase of oscillations with a period 0.2 seconds. DOE

N82-31866# New York Sea Grant Inst., Albany.
GREAT LAKES COASTAL GEOLOGY: THE SEDIMENT PROBLEM AT TWELVEMILE CREEK INLET, LAKE ONTARIO, WILSON NEW YORK
Kim K. Fortune and Parker E. Calkin Sep. 1981 43 p refs
(PB82-161100; NOAA-81111204) Avail: NTIS HC A03/MF A01 CSCL 08G

An active gravel barrier dominates the mouth of the West Branch of Twelvemile Creek, Wilson, NY. Under natural conditions this barrier builds up to separate completely the estuary of the creek from Lake Ontario. To keep the creek open, the town of Wilson has supported costly dredging operations. Monitoring the effects of various wave and shoreline processes provides the geologic information necessary to determine how the town can solve this problem. Studies of wind and wave patterns, sediment

size and distribution, and a fluorescent tracer study show that most of this sediment is composed of the red fine grained sandstones and shales of the locally exposed Queenston Formation. GRA

N82-31867# CER Corp., Las Vegas, Nev.
A GEOLOGIC STUDY OF THE ARKOMA BASIN AND QUACHITA MOUNTAINS Final Report
James M. Gromer Jul. 1981 81 p refs
(Contract GRI-5011-321-0130)
(PB82-169673; GRI-81/0025) Avail: NTIS HC A05/MF A01 CSCL 08I

A geologic reconnaissance of the stratigraphy and structure of the Arkoma Basin and Quochita Mountains of Oklahoma and Arkansas is presented with focus on low permeability gas bearing formations. Past exploratory, development and stimulation activities within the study area are reviewed as an aid in the evaluation of tight gas sands and technology development of the region. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-31868*# Texas A&M Univ., College Station.
RAWINSONDE SOUNDING DATA AND SYNOPTIC CONDITIONS FOR THE CCOPE-VAS EXPERIMENT, JULY 1981 Final Report
Walter K. Henry Washington NASA Jul. 1982 177 p
(Contract NAS8-31773)
(NASA-CR-3589; M-385; NAS 1.26:3589) Avail: NTIS HC A09/MF A01 CSCL 04B

During the cooperative convective precipitation experiment, eight times were selected as VISSR atmospheric sounder (VAS) observation periods. A synoptic analysis of the surface and the 850, 700, 500, 300, and 200 maps for those eight periods. The satellite and radar data for those periods are included with the analyses. There were five rawinsonde stations in eastern Montana which made extra soundings for the VAS periods. S.L.

N82-31869# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPATIAL VARIABILITY OF PRECIPITATION IN THE NORTH-NORTHEASTERN REGION OF SOUTH AMERICA [VARIABILIDADE ESPACIAL DA PRECIPITACAO NA REGIAO NORTE-NORDESTE DA AMERICA DO SUL]
Antonio Divino Moura and Mary Toshie Kagano Feb. 1982 28 p refs In PORTUGUESE; ENGLISH summary
(INPE-2318-RPE/402) Avail: NTIS HC A03/MF A01

The spatial distribution of the deviations from the normal precipitation over tropical South America was investigated using the available data since the beginning of the century. The spatial scale associated with these deviations was established based on dry and wet years for Northeastern Brazil. It was found that, on the average, the NE drought spatial scale is not confined to that region but extends from 35 deg W up to 65 deg W of longitude. The results show that there is an inverse relationship between the NE Brazil and Guyaras rainfall, in accordance with previous results. Also, it was found a direct relationship between the NE rainfall and that of Colombia and Venezuela region. Author

N82-31870# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FORECASTING DROUGHTS IN THE NORTHEAST BY THE METHOD OF PERIODICITIES: USE AND ABUSES [PREVISAO DE SECAS NO NORDESTE PELO METODO DAS PERIODICIDADES: USO E ABUSOS]
Carlos Afonso Nobre, Horacio H. Yanasse, and Corina C. F. Yanasse Mar. 1982 62 p refs In PORTUGUESE; ENGLISH summary
(INPE-2344-RPE/407) Avail: NTIS HC A04/MF A01

Statistical analysis of Fortaleza, Ceara, Brazil rainfall series is presented (1849 - 1978). Several tests for white noise showed that the series is not uncorrelated at 95% confidence level. Periodicities of approximately 13 and 26 years were found to be statistically significant. A forecasting model based on these periodicities was built. It is seen that the two periodicities explained only 24% of the series' variance. Several limitations of such a forecasting model were discussed. It was concluded that the uncertainties involved in drought forecasting in northeastern Brazil based on this model are high. Therefore it is recommended that these drought forecasts be viewed with great care. Author

N82-31871# Systems and Applied Sciences Corp., Monterey, Calif.
OCEAN/TROPOSPHERE/STRATOSPHERE FORECAST SYSTEMS: A STATE-OF-THE-ART REVIEW Final Report
Russell L. Elsberry, Robert L. Haney, R. Terry Williams, Richard S. Bogart, Harry D. Hamilton, and Elbert F. Hinson Feb. 1982 83 p refs
(Contract N00228-81-C-H309)
(AD-A115129; NEPRF-CR-82-04) Avail: NTIS HC A05/MF A01 CSCL 04/2

The question of the feasibility of developing a coupled Ocean-Troposphere-Stratosphere Forecast System is discussed. The system would be run operationally by Fleet Numerical Oceanography Center (FNOC). Specifically, the state-of-the-art ocean-atmosphere modeling is reviewed to decide if such a forecast system is feasible during the next five years (1982-87). The conclusion of the review is that such a system is not operationally feasible in the next five years. Modeling research efforts at various institutions and laboratories have been unable to reproduce many of the observed interactions between the ocean-troposphere and troposphere-stratosphere. In some instances, models have produced erroneous interactions, actually degrading atmospheric forecast skill when compared to models without these interactions. Until such time as the state-of-the-art of coupled ocean and atmosphere models can guarantee benefits from simulating these interactions, operational use of them is not advised. GRA

N82-31872# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F. SHEPPARD AFB, TEXAS Final Report
22 Mar. 1982 450 p
(AD-A116086; AD-E850167; USAFETAC/DS-82/018) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Sheppard AFB, Texas. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cove; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-31873# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: CAIRO WEST ARPT, EGYPT Final Report
20 Apr. 1982 400 p
(AD-A116093; AD-E850172; USAFETAC/DS-82/025) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Cairo West Airport, Egypt. It contains the following parts:(1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts

and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and mimimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases percentage frequency of occurring tables. GRA

N82-31874# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: LAUGHLIN AFB, TEXAS Final Report
15 Apr. 1982 450 p
(AD-A116094; AD-E850173; USAFETAC/DS-82/026) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Laughlin AFB, Del Rio, Texas. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. Author (GRA)

N82-31875# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: FRIENDSHIP IAP, MARYLAND Final Report
4 May 1982 450 p
(AD-A116096; AD-E850169; USAFETAC/DS-82/028) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Friendship IAP, Maryland. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface Winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. Author (GRA)

N82-31876# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: PATUXENT RIVER NAS, MARYLAND Final Report
14 May 1982 400 p
(AD-A116097; AD-E850174; USAFETAC/DS-82/029) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Patuxent River Naval Air Station, Maryland. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. Author (GRA)

N82-31877# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
MOODY AFB, GEORGIA. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: MOODY AFB, GEORGIA Final Report
21 May 1982 425 p
(AD-A116098; AD-E850175; USAFETAC/DS-82/030) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Moody AFB, Valdosta, Georgia. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. Author (GRA)

N82-31878# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: PHELPS-COLLINS, ALPENA, MICHIGAN Final Report
19 May 1982 425 p
(AD-A116099; AD-E850176; USAFETAC/DS-82/031) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a 6 part statistical summary of surface weather observations for Phelps-Collins Field, Alpena, Michigan. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface Winds; (4) Ceiling versus Visibility Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrring tables. GRA

N82-31879# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F: BRUNSWICK NAS, MAIN Final Report
2 Jun. 1982 450 p
(AD-A116100; AD-E850177; USAFETAC/DS-82/032) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Brunswick NAS, Maine. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temper-

tures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-31880# Naval Environmental Prediction Research Facility, Monterey, Calif.
HURRICANE HAVENS HANDBOOK FOR THE NORTH ATLANTIC OCEAN Final Report
Roger J. B. Turpin and Samson Brand Jun. 1982 294 p refs
(AD-A116101; NEPRF-TR-82-03) Avail: NTIS HC A13/MF A01 CSCL 04/2

This handbook is a ready-reference decision-making aid for commanding officers or other individuals responsible for the safety of ships facing a hurricane threat. Guidance on assessing a hurricane threat and choosing appropriate countermeasures at specific North Atlantic ports is provided in Sections II-onward. However, the Handbook is not exclusively dedicated to ships at these ports, and the general guidance of Section I will assist ships at other ports or at sea. Author (GRA)

N82-31881# Naval Research Lab., Washington, D. C. Atmospheric Physics Branch.
THE DATA BASE FOR THE MAY 1979 MARINE SURFACE LAYER MICROMETEOROLOGICAL EXPERIMENT AT SAN NICOLAS ISLAND, CALIFORNIA Final Report
Theodore V. Blanc 7 May 1982 631 p refs
(AD-A116210; NRL-MR-4713) Avail: NTIS HC A99/MF A01 CSCL 04/2

One hundred thirty-six hours of gradient (profile) and bulk aerodynamic measurements of momentum, moisture, and sensible heat flux, accompanied by determinations of stability, drag coefficient, roughness length, and sky radiation were made in the marine atmospheric surface layer over the Pacific Ocean from an upwind, low-profile promontory of San Nicolas Island, California. Over a 10-day period a wide variety of meteorological and oceanographic conditions were observed in which 30-minute average wind speeds ranged from 2 to 17 m/s, air-water temperature difference from -2.1 to +0.6 C, dew point-water temperature differences from -7.5 to -2.0 C. and Richardson number stabilities from -2.7 to +0.1. Subsequently, 10% of the data were acquired under stable atmospheric conditions and 15% at wind speeds in excess of 12 m/s. The micro-meteorological observations were accompanied by 80 hours of aerosol size distribution observations of particles ranging from 0.3 to 14 micrometers in radius, 171 hourly measurements of upwind wave period and height, 59 hourly measurements of atmospheric radon (222Rn), and typically twice daily high resolution radiosonde measurements for determining the height of the marine inversion. The data includes measurement error values for the various flux and stability related parameters. GRA

N82-31882# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
IDENTIFICATION OF EUROPEAN AIR MASSES USING AN INTERACTIVE COMPUTER TECHNIQUES FOR SEPARATING MIXED NORMAL DISTRIBUTIONS M.S. Thesis
Cranston R. Coleman, Jr. 1982 53 p refs
(AD-A116712; AFIT/NR-82-13T) Avail: NTIS HC A04/MF A01 CSCL 04/2

The interactive computer program developed here is a time and work saving extension of a partial collective method for examining air masses which was first introduced by Essenwanger (1954). The partial collective method is based on the assumption that frequency curves of conservative air mass properties, such as equivalent potential temperature, are comprised of a series of normal curves, each representing a different air mass. For the purposes of this study, the interactive computer method is applied to the analysis of fall and winter air masses over six European stations with examination of equivalent potential temperature at the surface, 850 mb (millibars), 700 mb, and 500 mb levels. Five major air masses are identified as affecting central Europe during the winter at the surface, 850 mb and 700 mb levels, and four air masses at the 500 mb level. In the fall, six air masses are discernable at the surface and 700 mb with five appearing at 850 mb and 500 mb. The computer technique which is used here to analyze European air masses is not limited to air mass analysis, but may be applied universally to the separation of mixed normal distributions. GRA

N82-31883# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Elegronik.
MOBILE WEATHERSTATION
Hubert Hahn, Peter Koutny, Helmut Schwabach, and Hugo Eisenwagner Jan. 1981 17 p
(OEFZS-4054; EL-66/81; LA-92/81) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A mobile weather station is described which measures the following parameters: air temperature, relative humidity, wind direction and wind speed. The station consists of three main units the central station METEODAT, the multiplexer and the weather measure tower with the sensors. The measured data are displayed in digital form in the central unit and can be printed on a teletype. The power supply is either 220 Volt ac or 24 Volt dc. DOE

N82-31732# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SNOW IN CLIMATE DIAGNOSIS AND MODELING, INTRODUCTION
George Kukla, ed., A. Hecht, ed., and D. Wiesnet, ed. *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 11-12 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31733# Scripps Institution of Oceanography, La Jolla, Calif.
SNOW COVERS IN CLIMATE AND LONG-RANGE FORECASTING
Jerome Namias *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 13-26 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31734# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SNOW COVERS AND CLIMATE
George Kukla *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 27-39 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31735# Maryland Univ., College Park. Dept. of Meteorology.
THE USE OF SNOW AND ICE IN ENERGY BALANCE CLIMATE MODELING
Alan Robock *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 41-43 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31736# National Oceanic and Atmospheric Administration, Princeton, N. J. Geophysical Fluid Dynamics Lab.
SUMMARY REQUIREMENTS OF GCMS FOR OBSERVED SNOW AND ICE COVER DATA
Douglas G. Hahn *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 45-53 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31737# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
NORTHERN HEMISPHERE SNOW AND ICE CHARTS OF NOAA/NESS
Frank Smigielski *In* International Geophysical Year World Data

Center A Snow Watch 1980 Oct. 1981 p 59-62 (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31738# Air Force Global Weather Central, Offutt AFB, Nebraska.
THE US AIR FORCE SNOW COVER CHARTS
Robert C. Woronicz *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 63-70 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31741# Lamont-Doherty Geological Observatory, Palisades, N. Y.
LAMONT CLIMATIC SNOW COVER CHARTS
George Kukla, David Robinson, and J. Brown *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 87-92 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31744# Lamont-Doherty Geological Observatory, Palisades, N. Y.
CLIMATIC VALUE OF OPERATIONAL SNOW AND ICE CHARTS
George Kukla and David Robinson *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 103-120 refs (For primary document see N82-31731 22-42)
(Grants NSF ATM-77-28522; NSF ATM-80-01470)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31746# Nebraska Univ., Lincoln.
SNOW COVER DIGITAL PRODUCTS
Kenneth F. Dewey *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 129-134 ref (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31749# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SNOW AND ICE INDICES
George Kukla and Joyce Gavin *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 145-148 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-31884*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LIDAR AND ACOUSTICS APPLICATIONS TO OCEAN PRODUCTIVITY
D. J. Collins 1 Jun. 1982 73 p refs
(Contract NAS7-100)
(NASA-CR-169264; JPL-Pub-82-56; NAS 1.26:169264) Avail: NTIS HC A04/MF A01 CSCL 08C

The requirements for the submersible, the instrumentation necessary to perform these measurements, and the optical and acoustical technology required to develop the ocean color scanner instrumentation are described. The development of a second generation ocean color scanner produced the need for coincident in situ scientific measurements which examine the primary productivity of the upper ocean on time and space scales which are large compared to the environmental scales. The vertical and horizontal variability of the biota, including the relationship between chlorophyll and primary productivity, the productivity of zooplankton, and the dynamic interaction between phytoplankton and zooplankton, and between these populations and the physical environment are investigated. A towed submersible will be constructed which accommodates both an underwater LIDAR instrument and a multifrequency sonar. E.A.K.

N82-31885# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PRELIMINARY RESULTS OF A STATISTICAL MODEL FOR PREDICTION OF THE VERTICAL THERMAL STRUCTURE OF THE WATERS TO THE SOUTHEAST OF BRAZIL [RESULTADOS PRELIMINARES DE UM MODELO ESTATISTICO PARA PREDICAO DA ESTRUTURA TERMICA VERTICAL NAS AGUAS DO SUDESTE DO BRASIL]
Jose Luiz Stech, Merritt Raymond Stevenson, and Hector Manuel Inostroza Villagra Feb. 1982 27 p refs In PORTUGUESE Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981
(INPE-2331-RPE/405) Avail: NTIS HC A03/MF A01

A correlation between the surface and vertical temperatures of the sea is discussed. For this, an ocean area was selected extending from 22 deg S to 25 deg S Latitude and 40 deg W to 45 deg W in the southwest Atlantic Ocean. The area was subdivided into squares of 1/2 deg by 1/2 deg. Two of these squares were utilized, one close to the coast and the other being more oceanic. The calculated statistical parameters relating the surface and vertical temperature structures were: mean temperature, standard deviation, variance and confidence intervals for every period of three months and for the two squares. The relationships found were good and consistent with the data utilized. Author

N82-31886# Hawaii Inst. of Geophysics, Honolulu.
BEACH CHANGES ON OAHU AS REVEALED BY AERIAL PHOTOGRAPHS
Dennis Hwang Jul. 1981 150 p refs Prepared in cooperation with the Urban and Regional Planning Program
(Contract SG-NA79AA-D-00085)
(PB82-163007; UNIHI-SG-CR-81-07; NOAA-81120315) Avail: NTIS HC A07/MF A01 CSCL 08C

An aerial photographic analysis of the beaches of Oahu was conducted for a period of up to 50 years. The results indicate that the most unstable beaches are on sand bodies projecting from the coastline, such as Kualoa Point, Iroquois Point, and Paiko Peninsula. Beach changes on Oahu can be characterized by the coastline. On the north shore, intermittent erosion occurs when the beach is overwashed by waves of unusual height and force. Aerial photographs record the effects of the December 1 to 4, 1969 storm, 1946 tsunami and possibly the 1957 tsunami. GRA

N82-31739# National Oceanic and Atmospheric Administration, Washington, D. C. Basic Weather Branch.
SEA ICE CHARTS OF THE NAVY/NOAA JOINT ICE CENTER
Raymond H. Godin *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 71-78 (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31740*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTARCTIC SEA ICE COVER FROM SATELLITE PASSIVE MICROWAVE
H. J. Zwally, J. Comiso, C. Parkinson, W. Campbell, F. Carsey, and P. Gloersen *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 79-86 (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

N82-31743# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
STUDY OF THE SEA ICE DISTRIBUTION IN THE NORTH POLAR REGIONS
Ingrid Haupt *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 97-102 refs (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-31887*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
WORKSHOP ON CLOSED SYSTEM ECOLOGY
15 Jul. 1982 19 p refs Workshop held in Pasadena, Calif., 18-22 Jan. 1982
(NASA-CR-169280; JPL-Pub-82-64; NAS 1.26:169280) Avail: NTIS HC A02/MF A01 CSCL 06C

Self maintaining laboratory scale ecological systems completely isolated from exchanges of matter with external systems were demonstrated. These research tools are discussed in terms of their anticipated value in understanding (1) global ecological material and energy balances, (2) the dynamics of stability and instability in ecosystems, (3) the effects of man-made substances and structures on ecosystems, and (4) the precise requirements for dynamic control of controlled ecology life support systems (CELSS). N.W.

N82-31888*# Tufts Univ., Medford, Mass Dept. of Physics.
DIFFUSION MEDIATED LOCALIZATION ON MEMBRANE SURFACES
David L. Weaver Aug. 1982 26 p refs
(Contract NCA2-OR785-201)
(NASA-CR-166386; NAS 1.26:166386) Avail: NTIS HC A03/MF A01 CSCL 07D

Using the model of a cell membrane of a spherical surface in which membrane components may diffuse, the rate of localization due to trapping under diffusion control has been estimated by computing an analytical expression for the mean trapping time including the possibilities of a trapping probability less than one and/or the establishment of an equilibrium at the trap boundary. Author

N82-31889# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazoni.
ELECTRON PARAMAGNETIC RESONANCE ASSIGNMENT: AN ANALYSIS OF METHODS USED FOR BIOLOGICAL SAMPLES [ANALISI DELLE METHODICHE PER MISURE DI EPR SU CAMPIONI BIOLOGICI]
F. Ianzini and A. Rosi Mar. 1982 25 p refs In ITALIAN; ENGLISH summary
(ISS-T-82/2; ISSN-0390-6485) Avail: NTIS HC A02/MF A01

Sample conditioning methods for freeze-drying, homogenization and freezing, used for the electron paramagnetic resonance assessment of biological molecular activity in cells, tissues and fluids are described. The procedure based on 77 K freezing is found to be the most suitable for fluids and tissues analysis. Author (ESA)

N82-31890# Research Inst. of National Defence, Stockholm (Sweden). Inst. of Aviation Medecine.
A TECHNIQUE FOR LONG-TERM MEASUREMENTS OF THYROID FUNCTION IN BEAGLE DOGS USING IODINE 125
Ove Wilson, John M. Stone (California Univ., Davis), and D. Edwin Monty (Arizona Univ., Tucson) Dec. 1979 39 p refs Sponsored by Swedish Medical Research Council
(FOA-A-59003-H3) Avail: NTIS HC A03/MF A01

A procedure for measuring thyroid uptake and retention of I 125 is described. After a single dose of 1.85 MBq the thyroid retention curve can be followed for 3 to 6 months or more. Physiologic changes and experimental manipulations of thyroid function are observed by changes in the slope of the release curve. The form of the slope of the curve is useful for determining biological half life, evaluating changes in turnover, calculating release rate exponentials, and for analyzing iodine compartmental distribution. Backscatter and attenuation affect measurements of I 125 uptake more than measurements made with I 131. The major disadvantage of I 125 is the extent of its absorption in tissues, which is partially counterbalanced by backscatter from the tissues surrounding the thyroid. Backscatter in the Lucite neck phantom can exceed attenuation. Author (ESA)

N82-31891# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Lab. Central.
BIOCORROSION [BIOCORROSION]
G. Dallemagne 1982 14 p refs In FRENCH Presented at Ecole Natl. Super. de Chim. Ecole d'Ete sur Corrosion et Protection des Metaux, Les Houches, France, Sep. - Oct. 1981
(SNIAS-821-551-105; DCQ/L-160.390/82) Avail: NTIS HC A02/MF A01

Microorganisms which cause biocorrosion, factors which favor their development, and detection and treatment of biocorrosion are discussed. It is impossible to eradicate traces of water, in which the organisms develop, from contaminating fuel tanks, so fuel should be kept as free of water as possible. Synthetic liners which inhibit organism growth, and which are chemically resistant to water and jet fuel are suggested. It is possible that potassium bichromate, and boron compounds are good fungicides and bactericides. Author (ESA)

N82-31892# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 16, NO. 4, JULY - AUGUST 1982
20 Aug. 1982 162 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 97 p
(JPRS-81599) Copyright. Avail: Issuing Activity

Biological and medical tests conducted on animals and humans during and after manned spaceflights are reported. The following topics are discussed: psychological and physiological effects and changes, hemodynamic responses, nervous system and sensorimotor performance, neurological tests, cardiovascular system tests, biochemistry, developments in medical technology, and biological and physiological stress tests. For individual titles, see N82-31893 through N82-31921.

N82-31893# Joint Publications Research Service, Arlington, Va.
MAIN DIRECTIONS AND PRINCIPLES OF PSYCHOLOGICAL EXPERTISE OF COSMONAUTS **c53**
K. K. Ioseliani, A. L. Narinskaya, and Sh. R. Khisambeyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 1-8 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 4-8 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Personality and psychological stability tests, used in the decision making of cosmonaut selection and the successful completion of their training are discussed. High demands are made on individual psychological, personality and professional qualities of cosmonauts to assure the reliability of the cosmonaut spacecraft system. The battery of psychological tests at the screening stage, routine and special certification and special training, aimed at selecting individuals whose psychological traits and personality make them eligible for professional work with specific space equipment, are outlined. E.A.K.

N82-31894# Joint Publications Research Service, Arlington, Va.
ANESTHESIA, SURGERY AND RESUSCITATION DURING MANNED SPACEFLIGHTS **c52**
L. L. Stazhadze, I. B. Goncharov, I. P. Neumyvakin, V. V. Pogomolov, and I. V. Vladimirov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 9-13 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 9-12 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Technical problems of spacecraft environments and the changes in the human body and how they effect medical aid aboard a manned spaceflight are discussed. In space flight anesthesia can be applied using methods as multicomponent balanced anesthesia and peridural anesthesia. Surgery and resuscitation can be performed, by procedures and methods that

allow operations in an abacterial environment, correction of vital dysfunctions with the aid of artificial pulmonary ventilation, cardiac electrotherapy, and sorptive purification of body fluids. Various aspects of infusion treatment and first medical aid are discussed. E.A.K.

N82-31895# Joint Publications Research Service, Arlington, Va.
REGIONAL HEMODYNAMIC CHANGES AFTER SPACEFLIGHTS LASTING UP TO EIGHT DAYS **c52**
T. D. Vasilyeva, Kh. Kh. Yarullin, and V. I. Zhuyko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 14-20 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 12-17 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Fourteen cosmonauts were exposed to rheographic examination before and after space missions, to measure the pulse blood filling, tone and elasticity of cerebral vessels, right lung and right leg vessels during tilt tests. Postflight examinations demonstrated distinct changes in the cerebral, pulmonary and peripheral circulation, indicating cardiovascular deconditioning. The greatest changes were seen in the tone of arteries, arterioles and veins of the brain hemispheres, vertebrobasilar system and the leg. The changes were reversible, requiring no special correction. The changes in different vascular compartments returned to normal in a nonuniform manner. E.A.K.

N82-31896# Joint Publications Research Service, Arlington, Va.
EFFECT OF OPTOKINETIC STIMULATION ON OPERATOR'S FUNCTIONAL STATE AND PROFESSIONAL WORK CAPACITY **c52**
L. N. Kornilova, S. L. Kravchenko, L. D. Smirichevskiy, and A. A. Belonogov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 21-25 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 17-20 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The effects of optokinetic noise on the physiological and professional parameters of a trained operator was examined. The pattern and level of changes in the parameters depend on the initial sensitivity to optokinetic stimulation. It is shown that the optokinetic stimulus, which leads to operator activity impairment, especially in spatial orientation is significant to the impaired orderlines of analyzer function, and its prolonged presence in subjects who are optokinetically unstable causes motion sickness symptoms. E.A.K.

N82-31897# Joint Publications Research Service, Arlington, Va.
DEHYDRATION THERAPY FOR SUBJECTS EXPOSED TO SIMULATED SPACEFLIGHT CONDITIONS **c52**
L. L. Stazhadze, T. M. Demidova, Zh. M. Kudryashova, and L. G. Repenkova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-82599) 20 Aug. 1982 p 26-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - aug. 1982 p 20-24 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The effect of intravenous injection of 20% mannitol in a dose of 1 g per kg body weight at a rate of 5 ml/min on the central circulation and cardiac contractile function was investigated. The infusions were performed on 18 healthy male volunteers, who participated in a head down tilt test, during the control period, on days 3, 7 and 14 of bed rest, and during the recovery. It was found that prolonged osmotherapy produced a clinically distinct dehydration effect without influencing central circulation, led to positive cardiodynamics, and an improvement of left ventricle contractile function. E.A.K.

N82-31898# Joint Publications Research Service, Arlington, Va.
STUDY OF OPERATOR'S INFORMATION IN THE COURSE OF COMPLICATED AND COMBINED ACTIVITY **c32**
N. V. Krylova and A. K. Bokovikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 33-36 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 25-27 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Speech characteristics of operators performing control and observation operations, Information reception, transmission and processing, and decision making when exposed to the real stress of parachute jumps were investigated. Form and content speech characteristics whose variations reflect the level of operators adaptation to stressful activities are reported. J.D.

N82-31899# Joint Publications Research Service, Arlington, Va.
USE OF VOICE COMMUNICATION TO STUDY OPERATOR ACTIVITY **c32**
A. P. Bebutov, V. V. Danilovtsev, and N. V. Krylova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 37-41 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 27-29 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Operator activity combined with voice communication was investigated. The subject performed tasks pertaining to control of a dynamic object which moved in the form of a cursor over the screen of a cathode ray tube following different trajectories. It is shown that the quality of control functions of the operator does not decrease and in some events even increases when reporting is simultaneous. An analysis of operator reports clarifies the process of problem solving associated with the control over moving objects. J.D.

N82-31900# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF FUNCTIONAL STATE OF HEAVY TRANSPORT HELICOPTER PILOTS IN THE COURSE OF FLIGHT SHIFT **c54**
Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 42-45 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 30-32 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Before and after flights about 300 crewmembers of heavy transport helicopters were examined, using psychophysiological and integral methods. During a flight shift the health state of helicopter pilots varies via three stages: habituation, initial decline, and distinct lassitude, with the latter developing after a five hour flight load. In order to increase human reliability in the pilot-helicopter system, it is advisable to allow four hours flight time during a flight shift onboard helicopters of the above type. In this case the pilot exposure to vibration effects will also be limited. The paper describes a maximally permissible spectrum of vibration velocity for a four hour exposure. Author

N82-31901# Joint Publications Research Service, Arlington, Va.
CONTROLOGRAPHY USED FOR INTEGRAL ASSESSMENT OF MENTAL WORK CAPACITY **c53**
K. K. Ioseliani, A. L. Narinskaya, and Sh. R. Khisambeyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 46-49 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 32-35 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Human mental performance was evaluated with the aid of a controlograph. Three groups with a high, medium, and low level of mental performance were detected. It was found that the method of controlography can be used to predict human capacity to perform complex operational functions. An integrated evaluation of mental performance by means of the controlographic technique was in good agreement with the results obtained by the traditional methods. Author

N82-31902# Joint Publications Research Service, Arlington, Va.
SEISMOCARDIOGRAPHIC EVALUATION OF CONTRACTILE FUNCTION OF THE MYOCARDIUM OF HYPOKINETIC RATS
V. I. Kuznetsov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 50-55 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v.16, no. 4, Jul. - Aug. 1982 p 35-38 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Seismocardiograph (SCG) recording in rats was explored and SCG time and amplitude parameters were determined. The measurements were performed on normal rats and hypokinetic rats with an altered cardiac contractility. The SCG data obtained in hypokinetic rats were compared with the results derived from contractility studies by heart catheterization and subsequent calculation of contraction strength and velocity. It is shown that the data compared are similar on hypokinetic days one and five. This suggests that the seismocardiographic method of studying heart contractility function of rats is adequate for integrai evaluations of the strength and velocity of cardiac contractions in chronic experiments. On hypokinetic days fifteen and thirty the data obtained by catheterization and seismocardiographically are at variance. This is attributed to muscle mass losses and variations in the rigidity of 'internal' bonding. Author

N82-31903# Joint Publications Research Service, Arlington, Va.
MORPHOLOGY AND COAGULANT FUNCTION OF HUMAN BLOOD SYSTEM DURING LONG EXPOSURE TO LOW AMMONIA CONCENTRATIONS IN A SEALED ENVIRONMENT **c52**
M. P. Kalandarova and L. S. Pochukayeva *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 56-59 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 39-41 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

A group of test subjects was kept in a chamber in which the ammonia concentrations 5.1 + or - 0.05 mg/cu m and 2.1 + or - 0.1 mg/cu m were maintained for 17 and 31 days, respectively; on days 22 and 38 the ammonia concentration was increased to 9.3 + or - 0.1 mg/cu m. During this exposure the norphological composition (red blood cells, hemoglobin, reticulocytes, platelets, white blood cells and their various types), as well as the coagulative-anticoagulative system (factor 4 of platelets, index of blood clot retraction, recalcification time, thrombin time, ethanol and protamine sulphate paracoagulation test, fibrinogen degradation products, fibrinolytic activity, and fbrinogen and prothrombin content) were investigated. The parameters characterizing hemopoiesis and status of the coagulative-anticoagulative system did not show any significant changes. However, a slight decrease in the counts of leukocytes, neutrophils, and eosinophils is of concern, because in space flight resistance to different infections declines. Author

N82-31904# Joint Publications Research Service, Arlington, Va.
PERCUTANEOUS MEASUREMENT OF PARTIAL OXYGEN TENSION AND LOCAL BLOOD FLOW IN MAN DURING ORTHOSTATIC TEST **c52**
O. Ye. Ozerova and Asyamolova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 60-64 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 41-44 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Using a Drager oximeter modified by a Clark polarographic electrode, transdermal measurements of partial pressure of oxygen (p sub td O2) and local blood flow (Q) were carried out in 46 test subjects during tilt test (20 min). As a result of blood redistribution, at minute 1 Q increased significantly in the lower body ($p<0.01$) and decreased in the upper body ($p<0.01$). Regardless of the sensor location, p sub td O2 increased in most cases. M.G.

N82-31905# Joint Publications Research Service, Arlington, Va.
ACTIVITY OF RAT ADRENAL MEDULA AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. A. Kvetnansky *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 65-69 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm, Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 44-47 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

After a 18.5-day space flight on Cosmos-1129 rat adrenals were investigated for the concentration of catecholamines and activity of enzymes involved in their synthesis, i.e., tyrosne hydroxylase, dopamine-betahydroxylase, and phenyl ethanol amine-N-methyl transferase. It was found that inflight the sympathoadreno-medullary system of rats was not exposed to a prolonged or strong stressogenic effect. Post--flight the rats showed an increased reactivity to the immobilization stress. Author

N82-31906# Joint Publications Research Service, Arlington, Va.
STEREOLOGICAL ANALYSIS OF RAT BONE TISSUE AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
A. A. Prokhonchukov and V. S. Peschanskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4 Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 70-73 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 47-49 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Stereological measurements of volume fractions of 53 samples of compact and spong structures of bones of 15 rats were carried out. The measurements were performed on cortical lamellae, trabecules and lacunae, channels of osteons, and matrices of femoral, tibial and fibular bones of rats. Postflight no significant changes were seen in the above parameters as compared to the vivarium controls. During readaptation to 1 g a slight increase in the volume fraction of spongy bones was noted. M.G.

N82-31907# Joint Publications Research Service, Arlington, Va.
CHANGES IN RAT TISSUE DEOXYRIBONUCLEOPROTEIN AND NUCLEIC ACIDS FOLLOWING FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
E. Misurova, R. A. Tigranyan, T. Sabova, and M. Praslicka *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 74-78 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 49-52 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The concentration of polydeoxyribonucleotides and nucleic acids was measured in the spleen, thymus, liver, bone marrow and blood of rats flown for 18.5 days on Cosmos-1129. The exposure led to an increase in the polydeoxyribonucleotide content in the thymus and a decrease of the DNA and RNA concentration in the spleen and thymus. These changes returned to normal at R+6. Author

N82-31908# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL DISTINCTIONS OF MACACA RHESUS MONKEY THYROID UNDER NORMAL AND VARIOUS TYPES OF HYPOKINETIC CONDITIONS
G. I. Plakhuta-Plakutina, Ye. A. Savina, G. S. Belkaniya, D. S. Tavadyan, N. P. Dmitriyeva, Ye. A. Amirkhanyan, and R. S. Smirnova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 79-87 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 52-58 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Thyroid glands and C cells of Macaca rhesus were examined histologically, electron microscopically, and morphometrically. The examinations were performed on six intact and seven hypokinetic rhesus monkeys which were kept in a suspension device for two months, small cages for two months or in a head-down position (seven days in a horizontal position and then eleven days in a head-down position at -6 deg). The experiment with a diminished motor activity and a normal support function of the lower limbs

(maintenance in small cages), in spite of its long duration, produced no structural changes in the parenchyma or C cells. The 18-day bed rest test was followed by a hypofunction of the thyroid gland, inhibition of hormonal synthesis, and secretion without distinct changes in C cells. Unlike previous experiments, the suspension study led to hyperplasia and hypertropy of C cells and increase of their nuclear volume. Activation of C cells can be regarded as an adaptive reaction aimed at stabilizing bone calcium. M.G.

N82-31909# Joint Publications Research Service, Arlington, Va.
EFFECTS OF +G SUB X ACCELERATION AND ADEUTRON ON NUCLEI ACID CONTENT AND OTHER PARAMETERS OF MOUSE PERIPHERAL BLOOD
M. I. Minkova, I. T. Nikolov, Ye. R. Datsov, T. P. Pantev, and V. B. Tenchova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 88-92 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 58-60 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The effect of acceleration and adeturon, a radioprotector, on the content of nucleic acids and the count, composition and osmotic resistance of white and red blood cells was investigated. Male mice of the H strain were exposed to +20G sub x for 5 min. The above parameters were measured 1, 24, and 48 hours after the exposure. The nuclei acid content decreased significantly immediately after the exposure and tended to return to normal afterwards. The leucocyte count was increased during all observation periods, and the erythrocyte count was decreased 1 hour after the exposure. Osmotic resistance of white and red blood cells varied in a different manner after the exposure. Adeturon administered at optimal protective doses (300 mg/kg) modified regulatory mechanisms of the animal body. M.G.

N82-31910# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF MAGNETIC FIELD PARAMETERS TO CHANGE IN EVOKED BIOELECTRIC ACTIVITY OF THE BRAIN
N. P. Smirnova, L. D. Klimovskaya, and A. S. Dyakonov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 93-97 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 61-63 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The effect of a constant uniform magnetic field of 0.1 to 1.€ T on the somatosensory potentials of the brain cortex and hypothalamus was investigated on nembutal anesthesized rats. The exposure increased the amplitude and modified the form of evoked potentials in both brain structures. The effect grew significantly with induction of the magnetic field. At every induction level changes in the evoked potentials of the hypothalamus were more distinct than those of the cortex. These findings were compared with the effects of a weakly pulsating magnetic field of the induction 0.1-0.4 T. Author

N82-31911# Joint Publications Research Service, Arlington, Va.
CYTOGENETIC EFFECTS OF HIGH-ENERGY CHARGED PARTICLES
R. D. Govorun, S. V. Vorozhtsova, and V. N. Gerasimenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. (JPRS-81599) 20 Aug. 1982 p 98-102 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 64-67 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The cytogenetic effects of irradiation were investigated in the bone marrow and corneal epithelium of mice, human white blood cells, and Stamm V79-4 cells of Chinese hamsters exposed to protons with energy = 9.2 GeV, deutons and helium ions with energy = 4.6 GeV/nucleon. It was demonstrated that with an increase in the irradiation dose the number of aberrant cells and chromosome aberrations grew. A high yield of exchange type aberrations was found. The proliferative activity of cells of bone marrow decreased and its depletion occurred. The relative biological effectiveness coefficients of high-energy particles varied from 1.3 to 2.7 in relation to the cell type and parameters measured. R.J.F.

N82-31912# Joint Publications Research Service, Arlington, Va.
CYTOGENETIC EFFECTS OF HEAVY CHARGED PARTICLES OF GALACTIC COSMIC RADIATION IN EXPERIMENTS ABOARD COSMOS-1129 BIOSATELLITE
L. V. Nevzgodina and Ye. N. Maksimova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 103-108 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 67-71 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

An experiment was carried out on lettuce (Lactuca sativa) seeds flown in a biocontainer equipped with plastic detectors to record heavy charged particles (HCP). The purpose of the experiment was to determine the yield of aberrant cells as a result of irradiation, and to identify this effect as a function of HCP topography in the seed. The cytogenetic examination of flight seedlings revealed a significant difference between the seeds which were hit with HCP and those that remained intact. This indicates a significant contribution of the heavy component of galactic cosmic radiation into the radiobiological effect. The relationship between the radiobiological effect and the HCP topography in the seed was established: zones of the root and stem meristem proved to be the most sensitive targets. Author

N82-31913# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF VESTIBULAR ASYMMETRY IN ROTATION TESTS **c52**
T. A. Nalimova, A. B. Savinkov, and R. V. Kofanov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 109-111 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 71-72 (For primary document see N82-31892 22-51) Avail: Issuing Activity

In order to detect transient vestibular dysfunctions, a group of 30 workers who were regularly exposed to noise and vibration at work were examined. A control group of 15 subjects was also examined. Rotation to the left and right in a Barany chair with sudden stopping was used. Electronysthgmograms (ENG) were recorded. Differences between the parameters for the tested groups were not demonstrated. Differences between ENG recorded both before and after work failed to demonstrate differences. This finding demonstrates that there were no gross disturbances in the vestibular system. R.J.F.

N82-31914# Joint Publications Research Service, Arlington, Va.
COMPARATIVE EVALUATION OF INFORMATIVENESS OF THREE CORRECTED ORTHOGONAL LEADS AND TWELVE CONVENTIONAL EKG LEADS IN CONDUCTING FUNCTIONAL TESTS **c52**
V. D. Turbasov and Z. A. Golubchikova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 112-116 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 72-75 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Data pertaining to the comparative evaluation of electrocardiogram (EKG) information obtained through the use of 3 corrected orthogonal leads as opposed to 12 conventional EKG leads is given. Statistically significant differences were observed with respect to some parameters. It was concluded, however, that the resemblance of dynamics of EKG parameters in direct and synthesized leads indicates that the cordinate system of the later does not change appreliably tests, as compared to the coordinate system of direct coordinate system of direct EKG leads. R.J.F.

N82-31915# Joint Publications Research Service, Arlington, Va.
DIAGNOSTIC USE OF ENZYMATIC TEST IN EXPERIMENTS ON MONKEYS

G. S. Belkaniya and N. I. Lemondzhava *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, no. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 117-126 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 75-81 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Standard data on serum activity of the three most widely used enzymes in clinical practices were analyzed, as was as the direction of enzymatic changes in the presence of various functional and pathological states in monkeys, in order to elaborate enxymodiagnostic criteria. Four hundred sixty one healthy monkeys were examined. R.J.F.

N82-31916# Joint Publications Research Service, Arlington, Va.
SYSTEM FOR AUTOMATIC ANALYSIS OF RHEOENCEPHALOGRAMS **c52**
I. V. Sokolova and Kh. Kh. Yarullin *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 127-130 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 81-83 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The automation of rheoencephalogram (REG) processing is discussed. The method for REG analysis stipulates that the rheographic curve Reg(t) for the duration of the cardiac cycle (T) reflects pulsating fluctuations in volumetric filling of blood in the examined vascular zone is such a manner that it can be rendered in the form of the sum of two components, a(t) and b(t), reflecting volumetric pulsation of the arterial and venous systems, respectively. R.J.F.

N82-31917# Joint Publications Research Service, Arlington, Va.
PREFLIGHT EXAMINATION RESULTS USED TO FORECAST COSMONAUT ENDURANCE OF ORTHOSTATIC TESTS AFTER SPACEFLIGHT **c52**
V. A. Degtyarev, Yu. M. Dovzhenko, L. A. Larionova, V. G. Doroshev, and N. A. Lapshina *In its* USSR Rept: Space Biol. and Aerospce Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 131-135 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 83-85 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The possibility of forecasting the postflight physical condition of cosmonauts in the readaptation period on the basis of preflight examination findings is discussed. R.J.F.

N82-31918# Joint Publications Research Service, Arlington, Va.
RENIN-ANGIOTENSIN-ALDOSTERONE SYSTEM AND ELECTROLYTE METABOLISM IN RAT BLOOD AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. Kvetnansky, R. A. Tigranyan, A. Jindra, and T. A. Viting *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 136-138 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, No. 4, Jul. - Aug. 1982 p 85-87 (For primary document see N82-31892 22-51)

Blood plasma aldosterone concentration and renin activity were studied in rats flow in space on the Cosmos 1129 satellite using radioimmunoassay techniques. Immediately after the flight, the animals presented significant decreases in plasma renin activity, as compared to rats in the vivarium control and animals in the synchronous experiment. R.J.F.

N82-31919# Joint Publications Research Service, Arlington, Va.
EPINEPHRINE AND NOREPINEPHRINE CONCENTRATIONS IN RAT CARDIAC VENTRICLES AND ATRIA AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. Kvetnansky and R. A. Tigranyan *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 139-142 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 87-89 (For primary document see N82-31892 22-51)

Demonstrable concentrations of norepinephrine and epinephrine in the four compartments of the myocardium of rats aboard the Cosmos 1129 satellite were analysed. Findings confirmed the hypothesis that there is elevation of the catecholamine level in the heart after spaceflights, probably due to the diminished functional load in weightlessness. Thus, this state is not a chronic stressor. However, some parts of the heart reacted to spaceflight by a drop in the norepinephrine level. R.J.F.

N82-31920# Joint Publications Research Service, Arlington, Va.
RAT BLOOD PLASMA CORTICOSTERONE AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. Kvetnansky and R. A. Tigranyan *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, no. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 143-145 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 89-90 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

The question of whether prolonged weightlessness is a chronic activator of the adrenal cortex was investigated. It was found that prolonged weighlessness is not a chronic activator. R.J.F.

N82-31921# Joint Publications Research Service, Arlington, Va.
DEOXYRIBONUCLEOPROTEIN AND NUCLEIC ACID CONTENT OF RAT TISSUES AFTER FLIGHT ABOARD COSMOS-936 BIOSATELLITE
E. Misurova, R. A. Tigranyan, K. Kropaceva, and M. Praslicka *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 146-150 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), V. 16, no. 4, Jul. - Aug. 1982 p 91-93 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

Changes in tissue levels of soluble polydeoxyribonucleopropeinsvin an artificial gravity (DDRN) environment aboard the Cosmos 936 biosatellite were studied. PDRN levels more than doubled in the spleen of rats submitted to weightlessness, as compared to vivarium and synchronous control groups. R.J.F.

N82-32069*# City of Hope Medical Center, Duarte, Calif. Div. of Neurosciences.
GEOMETRICAL CONSIDERATIONS IN THE SEPARATION OF BIOLOGICAL PARTICLES BY AFFINITY PARTITIONING
Steven D. Flanagan *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 124-129 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 06C

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-31922* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jul. 1982 111 p
(NASA-SP-7011(234); NAS 1.21:7011(234)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 356 reports, articles and other documents introduced into the NASA scientific and technical information system in June 1982. Author

N82-31923 Royal Naval Personnel Research Committee, London (England). Applied Psychology Unit.
A TRIMIX SATURATION DIVE TO 660 METERS: STUDIES OF COGNITIVE PERFORMANCE, MOOD AND SLEEP QUALITY
Robert H. Logie and Alan D. Baddeley Mar. 1982 24 p refs (RPN-2/82; BR83533) Avail: Issuing Activity

An He-O2-N2 (Trimix) gas mixture was tested. Data were obtained from two divers on cognitive performance tests (arithmetic ability, grammatical reasoning, perceptual speed, visuo-spatial

manipulation and semantic processing) during a simulated dive to 660 msw. At maximum depth there is a severe blanket impairment of ability to perform any of the tests. At shallower depths, impairments are not as marked, with performance at 300 msw close to that measured at surface pressure. Sleep quality is disrupted throughout the dive, with one subject affected more than the other. Mood patterns vary less systematically, with large individual differences. Low correlations between sleep quality and performance indicate that performance decrements are due almost entirely to breathing Trimix at high pressure. Author (ESA)

N82-31924# California Univ., Berkeley. Lawrence Berkeley Lab. Lighting Systems Research Dept.
NEW LOOK AT MODELS OF VISUAL PERFORMANCE
Robert Clear and Samuel Berman Jun. 1981 25 p refs Presented at the Illuminating Eng. Soc. Ann. Tech. Conf., Toronto, 9-13 Aug. 1981
(Contract W-7405-eng-48)
(DE82-001337; LBL-12496; CONF-810862-2) Avail: NTIS HC A02/MF A01

A discussion of the failure of a report on lighting recommendations to explicitly consider cost-effectiveness is presented. It is argued that in visual performance experiments, accuracy is as much a function of the relative worth of speed and accuracy as it is of visibility. In a task that consists of subtasks, such as comparing two lists, it may be necessary to explicitly model the effect of each subtask's visibility on speed and accuracy. Finally changes in print may be significant in that they can lead to changes in visual performance without a corresponding change in visibility. The current Commission Internationale de L'Elairage (CIE) model for visual performace CIE 19/2, does not consider the above factors. Althought it is believed that the CIE model is not useful as an application model, it is felt that the general features of the visibility/visual performance relationship are clear and are important to lighting design. DOE

N82-31925# Sandia Labs., Albuquerque, N. Mex.
SNLA HOST-TO-HOST TRANSFER SYSTEM
1981 36 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000089; SAND-81-2071C; CONF-811045-1) Avail: NTIS HC A03/MF A01

A host to host system is used to transmit files or elements between an 1108 and 1100/82 via an intercomputer coupler. The software that implements the host to host capability is discussed. DOE

N82-31926# Los Alamos Scientific Lab., N. Mex.
MEDICAL USES OF ACCELERATORS
James N. Bradbury 1981 50 p refs Presented at the 6th Intern. Summer Coll. on Phys. and Contemporary Needs, Islamabad, Pakistan, 15 Jun. 1981
(Contract W-7405-eng-36)
(DE82-000572; LA-UR-81-2805; CONF-8106159-1) Avail: NTIS HC A03/MF A01

Particle accelerators and their uses in connection with medically-related research, diagnosis, and treatment are discussed. For cancer radiotherapy, nuclear particles including protons, neutrons, heavy ions, and negative pi mesons have advantages compared to conventional radiations in terms of dose localization and/or biological effectiveness. Clinical evaluations of these particles are underway at a number of institutions. Accelerator-produced radionuclides are in widespread use for research and routine diagnostic purposes. Elemental analysis techniques with charged particles and neutrons are being applied to bone, blood, and other tissues. Finally, low-dose medical imaging can be accomplished with accelerated protons and heavy ions. The status and future of these programs are discussed. DOE

N82-31927# Sandia Labs., Albuquerque, N. Mex.
IMPLANTABLE, REMOTELY-PROGRAMMABLE INSULIN INFUSSION SYSTEM
G. A. Carlson, Raymond E. Bair, John I. Gaona, Jr., Jerry T. Love, and Ruben S. Urenda Oct. 1981 43 p refs
(Contracts DE-AC04-76DP-00789; AT(29-1)-789; Grant NIH-HD-11327-01)
(DE82-003084; SAND-81-2152) Avail: NTIS HC A03/MF A01

An implantable, remotely programmable insulin infusion system which has a mass of 280 grams and an implanted lifetime exceeding 2 years is described. The system uses a rotary solenoid-driven peristaltic pump controlled by low power CMOS timing circuitry which provides bimodal insulin delivery. Fifteen low rates from 0.39 to 5.9 units/hour and 15 high doses from 0.84 to 12.5 unis using U100 insulin are available. GRA

N82-31928# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Biophysics.
FLUID DISTRIBUTION IN PROGRESSIVE PULMONARY EDEMA: A LOW-TEMPERATURE SCANNING ELECTRON MICROSCOPY STUDY Ph.D. Thesis
Gregory Ross Hook Jun. 1981 100 p refs
(Contract W-7405-eng-48)
(DE82-002554; LBL-11516) Avail: NTIS HC A05/MF A01

High pressure pulmonary edema, a common medical disorder caused by venous hypertension following left ventricular heart failure, is discussed. Abnormal fluid accumulation in the alveolar air spaces results in a life threatening loss of respiratory function. The primary component of the fluid is water and therefore the study of water distribution in the alveolus can provide insight into high pressure pulmonary edema pathology. The new method of freeze fracture low temperature scanning electron microscopy (SEM) developed and applied to the study of pulmonary edema. This method combines freeze fracture sample preservation with SEM observation and retains pulmonary fluids in the frozen hydrated state for direct three dimensional SEM imaging of alveoli. Quantitative measurements of alveolar structures resulting from high pressure pulmonary edema were made from SEM micrographs. From these measurements a model for alveolar fluid distribution resulting from progressive high pressure edema was made. DOE

N82-31929# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
PROBABILISTIC METHODOLOGY FOR ESTIMATING RADIATION INDUCED CANCER RISK
D. E. Dunning, Jr., R. W. Leggett, and L. R. Williams 1981 7 p Presented at the ANS/ENS Topical Meeting on Probabilistic Risk Assessment, Port Chester, N.Y., 20 Sep. 1981
(Contract W-7405-eng-26)
(DE82-001474; CONF-810905-22) Avail: NTIS HC A02/MF A01

A computer code was developed to provide a versatile and convenient methodology for radiation risk assessment. The code allows as input essentially any dose pattern commonly encountered in risk assessments for either acute or chronic exposures, and this includes consideration of the age structure of the exposed population. Results produced by the analysis include the probability of one or more radiation-induced cancer deaths in a specified population, expected numbers of deaths, and expected years of life lost as a result of premature fatalities. These calculations include consideration of competing risks of death from all other causes. The program also generates a probability frequency distribution of the expected number of cancers in any specified cohort resulting from a given radiation dose. The methods may be applied to any specified population and dose scenario. DOE

N82-31930# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
NONINVASINE TECHNIQUES FOR CARDIOVASCULAR EXAMINATION OF INTEREST IN AEROSPACE MEDICINE [TECHNIQUES NON-SANGLANTES DE L'EXPLORATION CARDIOVASCULAIRE INTERET EN MEDECINE AEROSPATIALE]
R. Carre May 1982 205 p refs In FRENCH
(AGARD-AG-277(FR); ISBN-92-835-2109-9) Avail: NTIS HC A10/MF A01

In addition to standard electrocardiography and cardiac radiography, other noninvasive cardiological techniques used in

the evaluation of pilots include the Holter technique, echocardiography, ultrasonics, and isotopic exploration. Special tests of interest in aerospace medicine are cardiac rheoplethymyopathy with measurement of systolic period intervals, ballistocardiography, tests of lower body negative pressure, and tests using the tilt-table and the centrifuge. For individual titles, see N82-31931 through N82-31943.

N82-31931# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
PRINCIPAL ELECTROCARDIOGRAPHIC ANOMALIES IN THE EVALUATION OF PILOTS [PRINCIPALES ANOMAIES ELECTROCARDIOGRAPHIQUES DANS L'EXPERTISE DU PERSONNEL NAVIGANT]
R. Carre, A. Didier, and H. Ille *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 1-4 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

The cardiovascular system is the sysem most influenced by stress during the flight of high performance aircraft such as the Mirage 2000 or 4000 type. Military regulations covering the physical fitness of pilots requires absolute organic and functional integrity of the circulatory system and an electrocardiogram with six peripheral and precordial derivations is obtained at each evaluation of pilots of such aircraft. Unfitness is easily pronounced for rhythm problems, flutter, auricular fibrillation, trouble in condition, complete right or complete left bundle branch block, and effects of myocardial infraction. Electrocardiograms are discussed with focus on: (1) rhythm irregularities; (2) incomplete right bundle branch block; (3) left axial deviations and their relation to the left anterior hemiblock concept; the Wolf Parkinson White syndrome; and (5) irregularities of ventricular polarization. Trans. by A.R.H.

N82-31932# Hopital d'Instruction des Armees, Paris (France).
VENTRICULAR PREEXCITATION SYNDROMES [LES SYNDROMES DE PRE-EXCITATION VENTRICLAIRE]
J. Droniou *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 15-25 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Ventricular preexcitations constitute a group of conduction anomalies involving the premature activation of all or part of the ventricule by normal sine wave excitation. They can be asymptomatic, reduced to their electrocardiograph signatures alone or complicated with arrhythmias, which are often serious. The asymptomatic forms are the source of difficulties in the evaluation of pilots for two reasons: certain electrocardiograph anomalies suggestive of preexcitation do not have an unambiguous signification, and the prognosis is not easily predicted. Transl. by A.R.H.

N82-31933# Service de Medecine Aeronautique, Versailles (France).
THE EXERCISE ELECTROCARDIOGRAM [ELECTROCARDIOGRAMME D'EFFORT]
G. Leguay and A. Seigneuric *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 27-66 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

The physological basis of exercise electrocardography (EKG) is reviewed with emphasis on muscular contraction, maximum oxygen consumption, pulmonary exchanges, and the adaptation of circulation and of the heart to exercise. Indications and contrdications for the use of stress tests are discussed. The types, placement, and fixation of electrodes are among the basic techniques of exercise EKG described. Modalities of exercise are considered. Normal exercise EKG in coronary insufficiency, the diagnostic value of exercise EKG in cronary insufficiency, the use of the EKG as a criteria in determining severity of coronary insufficiency, and the prognostic value of stress EKG's are examined. Transl. by A.R.H.

N82-31934# Service de Medecine Aeronautique, Versailles (France).
CONTINUOUS ECG REGISTRATION ACCORDING TO THE HOLTER METHOD [ENREGISTREMENT CONTINU DE L'E.C.G. SELON LA METHODE DE HOLTER]
G. Leguay and A. Seigneuric *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 67-86 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

In 1949, Holter implemented a process which allows for the continuous recording of ECG's during anbulation. This process not only permits almost instantaneous knowledge of the electrical activity of the heart but also allows for modification of certain concepts, particularly with regards to arrhythmia. With constant improvement, this method presents two large centers of interest to cardiology: rhythm problems and the supervision of their treatment, and the repolarization problem. The technical modalities of the method are reviewed and implications for cardiology are summarized in order to suggest aspects of interest in aerospace medicine. Transl. by A.R.H.

N82-31935# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
THE CONTRIBUTION OF STANDARD RADIOGRAPHY IN CARDIOVASCULAR EXPLORATION DURING THE EXAMINATION OF PILOTS [APPORT DE LA RADIOGRAPHIE STANDARD DANS L'EXPLORATION CARDIO-VASCULAIRE AU COURS DE LA VISITE DU PERSONNEL NAVIGANT]
M. Puech and P. J. Metges (Hopital d'Instruction des Armees) *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 87-92 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Teleradiography of the heart and televised radiography are integrated and articulated in complementary cardiologic examinations. Nonbloody radiological techniques and their normal results are described as well as their contribution in a number of pathological situations usually encountered which can pose problems of fitness. Congenital cardiopathy, acquired valvular cardiopathy, and ischemic and obstructive cardiopathies are discussed as well as physiological factors affecting the size and shape of the heart in athletes and Africans. Transl. by A.R.H.

N82-31936# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
THE CONTRIBUTION OF CARDIAC MECHANOGRAMS IN THE EVALUATION OF PILOTS [APPORT DES MECANOGRAMMES CARDIAQUES DANS L'EXPERTISE DU PERSONNEL NAVIGANT]
R. Carre, R. Amoretti, A. Didier, and H. Ille *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 93-112 In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

The idea of graphically registering carotid pulsations or the apexogram is not recent, having been used in the nineteenth century by Chaveau, Marey, and Maceray. If such recordings were valuable to physiologists, they have been of little value to clinicians and experts on pilots. These nonbloody techniques are easily reproducible at each examination and tracings can be included in the pilot's file for comparison from one examination to another. Cardiac mechanograms provide three classes of information: (1) analysis of the heart murmur indicates the variety of cardiopathology by phonocardiography; (2) the study of arterial distensibility by the carotidogram; and (3) chronocardiographic measure by the study of systolic intervals, permitting determination of the value of myocardial muscle contraction. Transl. by A.R.H.

N82-31937# Hopital d'Instruction des Armees, Paris (France).
ECHOCARDIOGRAPHY IN THE EXAMINATION OF PILOTS [L'ECHOCARDIOGRAPHIE DANS L'EXPERTISE DU PERSONNEL NAVIGANT]

J. Droniou and A. Coignard *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 113-143 In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Echocardiography permits visualization of intracardiac structures thanks to the reflection of an ultrasonic beam by these structures. Introduced into the clinic in the 1950's, this technique has made an extraordinarily rapid advance, to the point of becoming an indispensable requirement in cardiologic examination. Its nonagressive character and its relative simplicity in operation, warrants repetition of the examination at will. Its sensitivity and reliability in experienced hands should give it an important place in the cardiological evaluation of pilots. Transl. by A.R.H.

N82-31938# Hopital d'Instruction des Armees, Versailles (France).
EXAMINING ARTERIAL FUNCTION BY DOPPLER VELOCIMETRY: THE ADVANTAGE IN AEROSPACE MEDICINE [EXPLORATION FONCTIONNELLE ARTERIELLE PAR VELOCIMETRIE DOPPLER INTERET EN MEDECINE AERONAUTIQUE ET SPATIALE]
A. Didier, H. Ille, C. Ribadeau-Dumas, Ph. Lantrade, and Ch. Hiltenbrand *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 145-158 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Since the work done by Satomura and Kato in Japan in the 1960's, the use of the Doppler effect to measure the rate of blood flow in vessels has developed and met with considerable success, particularly in France. It has become a routine examination in angiology. The precision of the data obtaind and the total innnocuousness of this investigative method requires that its place be defined in aeronautical and aerospace medicine for the medical evaluation of pilots as well as for the study of the physiological modification of arterial flow in organisms subjected to actual aeronautical and space constraints. Transl. by A.R.H.

N82-31939# Hopital d'Instruction des Armees, Paris (France).
CONTRIBUTION OF NUCLEAR MEDICINE IN CARDIOLOGY [APPORT DE LA MEDECINE NUCLEAIRE EN CARDIOLOGIE]
J. F. Gaillard *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 159-166 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Isotopic exploration techniques have a practically undeniable place among complementary cardiological examinations. In 1948 a radiocardiogram was introduced which recorded by external detection the dilution curve in cardiac cavities using a radioactive detector. Static scintigraphy appeared in 1964, and in the 1970's, the gamma camera was coupled with a computer to permit rapid dynamic studies with image processing. Benefitting from the same electronic progress and the same image reconstruction algorithm as tomodensitometry, gamma emission tomography obtained results in studies of vascularization and metabolism of the myocardium. Isotopic methods furnish data which, for the most part, were obtained only by bloody radiological explorations using the products of contrast and ultrasonics. Nuclear medicine is interested in the noninvasine functional study of an organ and the possibility of quantifying organ function and of describing it by curves, graphics, and images. To the expert, nuclear medicine is important because of the noninvasive character of most of the techniques used. Those techniques having an invasive character which are excluded in the initial step in pilot evaluation are cited.
Transl. by A.R.H.

N82-31940# Rome Univ. (Italy). Inst. Universitaire de Medecine Aerospatiale.
BALLISTOCARDIOGRAPHY: A NONINTRUSIVE METHOD MOVING TOWARDS CLINICAL APPLICATIONS [LA BALLISTOCARDIOGRAPHIE: UNE METHODE NON-INTRUSIVE AVANCANT VERS DES APPLICATIONS CLINIQUES]
A. deScano *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 167-181 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Ballistocardiography (BCG) can be defined as a noninvasive experimental method of recording and studying periodic accelerations of the mass of a body due to the reaction of inertial which it represents at each ventricula systole. The typical sequence of waves which constitutes BCG markings differ quantitatively according to the axis of the body (and also according to the state of repose and physical exercise), the age and pathological conditions of the body, and/or the large arterial vessels. The evolution of BCG from work one by J.W. Gordon in 1877 to the present is reviewed. Physiological factors determining the characteristics of the tracings, possible uses in detecting coronary disease and myocardial infaction, and research into three dimensional BCG and applications in microgravity environments are discussed.
Transl. by A.R.H.

N82-31941# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
THE ADVANTAGE OF THE TILT TABLE TEST IN EXAMINING CIRCULATORY FUNCTION [INTERET DU TEST A LA TABLE BASCULANTE EN EXPLORATION FONCTIONNELLE CIRCULATOIRE]
J. Timbal *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 183-190 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Although asking the subject to change position (rise from bed and stand immobile) is the simplest means of evaluate the transition from clinostatism to orthostatism, the results obtained are difficult to standardize because the calling into action of muscles affects the circulatory condition. The tilt table can be used evaluate objectively the rapidity and efficiency of cardiovascular reactions by modifying the application of the force of gravity. Short term effects during the transition from the horizontal to the vertical position are considered with respect to their value in examinations of circulatory function. The use of the tilt table in the selection of astronauts and in determining physical fitness is discussed and possible reasons for not using this method systematically are offered. Transl. by A.R.H.

N82-31942# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).
THE ADVANTAGE OF THE LOWER BODY NEGATIVE PRESSURE TEST IN AEROSPACE MEDICINE [INTERET DU TEST LOSER BODY NEGATIVE PRESSURE EN MEDECINE AEROSPATIALE]
B. Vettes and H. Viellefond *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 191-194 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

The study of the physiopathological effects of weightlessness is not easy since these effects appear only when the human organism escapes the attractive forces of Earth. It is necessary to resort to simulation to examine the functions of the different physiological systems implicated. Simulation of the incidence of weightlessness on the cardiovascular system shows that physiopathological effects appear very early leading to a new distribution of blood volume. So-called orthostatic tests reveal interesting elements of hemodynamic response. The tests actually provide two classes of blood volume repartition conforming to that observed during prolonged space flght and during the return to Earth. Some tests such as those carried out on a tilt table during long duration bed rest involve modification of the posture of the entire organism. Other tests simulate the difference of ambient pressure between the upper nd lower parts of the body by creating a mobilization of the blood volume in regions where ambient pressure is weakest. Transl. by A.R.H.

N82-31943# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).
TECHNIQUES FOR CARDIOVASCULAR EXAMINATION IN

HUMAN CENTRIFUGES AND THE PRINCIPAL RESULTS OBTAINED [LES TECHNIQUES D'EXPLORATION CARDIOVASCULAIRE EN CENTRIFUGEUSE HUMAINE ET LES PRINCIPAUX RESULTATS OBTENUS]

B. Vettes and H. Viellefond *In* AGARD Noninvasine Tech. for Cardiovascular Exam. of Interest in Aerospace Med. May 1982 p 195-203 refs In FRENCH (For primary document see N82-31930 22-52)
Avail: NTIS HC A10/MF A01

Sustained Gz and Gx accelerations have an undeniable effect on the cardiovascular system and consequently the use of a human centrifuge must always be made under strict surveillance of cardiovascular function, preferably using noninvasive techniques. The use of phonocardiography, electroplethysmography, rheoplethysmography, and pneumatic devices to record heart rate, arterial and venous pressure, and cardiac and local debits is described. The number and placement of the electrodes and the tracins obtained in electrocardiography are discussed as well as methods for determining peripheral light loss and central light dim as indications of hemodynamic tolerance as reflected in the visual field. The value of the centrifuge in studying the effectiveness of anti-g suits is also assessed. Transl. by A.R.H.

N82-31894# Joint Publications Research Service, Arlington, Va.
ANESTHESIA, SURGEY AND RESUSCITATION DURING MANNED SPACEFLIGHTS

L. L. Stazhadze, I. B. Goncharov, I. P. Neumyvakin, V. V. Pogomolov, and I. V. Vladimirov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 9-13 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 9-12 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31895# Joint Publications Research Service, Arlington, Va.
REGIONAL HEMODYNAMIC CHANGES AFTER SPACEFLIGHTS LASTING UP TO EIGHT DAYS

T. D. Vasilyeva, Kh. Kh. Yarullin, and V. I. Zhuyko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 14-20 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 12-17 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31896# Joint Publications Research Service, Arlington, Va.
EFFECT OF OPTOKINETIC STIMULATION ON OPERATOR'S FUNCTIONAL STATE AND PROFESSIONAL WORK CAPACITY

L. N. Kornilova, S. L. Kravchenko, L. D. Smirichevskiy, and A. A. Belonogov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 21-25 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 17-20 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31897# Joint Publications Research Service, Arlington, Va.
DEHYDRATION THERAPY FOR SUBJECTS EXPOSED TO SIMULATED SPACEFLIGHT CONDITIONS

L. L. Stazhadze, T. M. Demidova, Zh. M. Kudryashova, and L. G. Repenkova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-82599) 20 Aug. 1982 p 26-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - aug. 1982 p 20-24 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31903# Joint Publications Research Service, Arlington, Va.
MORPHOLOGY AND COAGULANT FUNCTION OF HUMAN BLOOD SYSTEM DURING LONG EXPOSURE TO LOW AMMONIA CONCENTRATIONS IN A SEALED ENVIRONMENT

M. P. Kalandarova and L. S. Pochukayeva *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 56-59 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 39-41 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31904# Joint Publications Research Service, Arlington, Va.
PERCUTANEOUS MEASUREMENT OF PARTIAL OXYGEN TENSION AND LOCAL BLOOD FLOW IN MAN DURING ORTHOSTATIC TEST

O. Ye. Ozerova and Asyamolova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 60-64 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 41-44 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31913# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF VESTIBULAR ASYMMETRY IN ROTATION TESTS

T. A. Nalimova, A. B. Savinkov, and R. V. Kofanov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 109-111 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 71-72 (For primary document see N82-31892 22-51) Avail: Issuing Activity

N82-31914# Joint Publications Research Service, Arlington, Va.
COMPARATIVE EVALUATION OF INFORMATIVENESS OF THREE CORRECTED ORTHOGONAL LEADS AND TWELVE CONVENTIONAL EKG LEADS IN CONDUCTING FUNCTIONAL TESTS

V. D. Turbasov and Z. A. Golubchikova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 112-116 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 72-75 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31916# Joint Publications Research Service, Arlington, Va.
SYSTEM FOR AUTOMATIC ANALYSIS OF RHEOENCEPHALOGRAMS

I. V. Sokolova and Kh. Kh. Yarullin *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 127-130 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 81-83 (For primary document see N82-31892 22-51)
Avail: NTIS Avail: Issuing Activity

N82-31917# Joint Publications Research Service, Arlington, Va.
PREFLIGHT EXAMINATION RESULTS USED TO FORECAST COSMONAUT ENDURANCE OF ORTHOSTATIC TESTS AFTER SPACEFLIGHT

V. A. Degtyarev, Yu. M. Dovzhenko, L. A. Larionova, V. G. Doroshev, and N. A. Lapshina *In its* USSR Rept: Space Biol. and Aerospce Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 131-135 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 83-85 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-32068*# Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.
SOME POTENTIAL BLOOD FLOW EXPERIMENTS FOR SPACE

Giles R. Cokelet, Herbert J. Meiselman (Univ. of Southern California, Los Angeles), and Harry L. Goldsmith (Univ. Medical Clinic, Montreal) *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 116-123 refs Sponsored in part by DOE (For primary document see N82-32058 22-70)
(Grant NIH-HL-233355)
(UR-3490-1720) Avail: NTIS HC A12/MF A01 CSCL 06P

N82-32282# Joint Publications Research Service, Arlington, Va.
CYBERNETIC ANALYSIS OF CARDIAC RHYTHM OF SALYUT-6 ORBITAL STATION CREW DURING GRADED EXERCISE TEST

R. M. Bayevskiy, Zh. V. Varsukova, and I. G. Tazetdinov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 38-44 refs Transl. into ENGLISH from Kardiologiya (USSR), v. 21, no. 11, Nov. 1980 p 100-104 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32283# Joint Publications Research Service, Arlington, Va.
COMBINED REHABILITATION AND THERAPEUTIC MEASURES IN SPACE MEDICINE
T. N. Krupina, A. V. Beregovkin, V. M. Bogolyubov, B. M. Fedorov, A. D. Yegorov, A. Ya. Tizul, V. V. Bogomolov, V. V. Kalinichenko, A. P. Ragulin, and V. A. Stepin *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 45-51 refs Transl. into ENGLISH from Sov. Med. (USSR), no. 12, Dec. 1981 p 3-8 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-31944*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SYNTHESIZED PROPELLER VIBRATION ON PASSENGER ANNOYANCE IN A TURBOPROP INTERIOR NOISE ENVIRONMENT
Sherman A. Clevenson Aug. 1982 20 p refs
(NASA-TM-84515; L-15298; NAS 1.15:84515) Avail: NTIS HC A02/MF A01 CSCL 05H

The effect of synthesized propeller vibration on passenger annoyance to aircraft noise was investigated in passenger ride quality apparatus. Passenger reactions of annoyance to a wide range of potential turboprop interior noise environments were obtained under three simulated vibration conditions: no vibration, armrest vibration, and armrest plus cabin vibration. The noises, ranging from 71 to 95 dB(A) consisted of a turbulent boundary layer with a factorial combination of five blade passage frequencies (50 to 200 Hz), two harmonic roll offs, and three tone to noise ratios. Results indicate that passenger annoyance to noise in the presence of armrest vibration did not significantly change. However, those passengers exposed to cabin plus armrest vibration while being exposed to noise lower rating for the combined cabin vibration and noise environment compared with the rating for the noise along environment. This result is predicted by the ride quality model. S.L.

N82-31945# Royal Aircraft Establishment, Farnborough (England).
THE AIRLINE PILOT'S VIEW OF FLIGHT DECK WORKLOAD A PRELIMINARY STUDY USING A QUESTIONNAIRE
G. A. Ellis and A. H. Roscoe Feb. 1982 26 p refs
(RAE-TM-FS(B)-465; BR83316) Avail: NTIS HC A03/MF A01

A self-administered questionnaire was distributed to 116 civil airline pilots in order to establish pilots' views on workload as a concept and from the viewpoint of their own flying task. Of the 98 questionnaires returned, 80% indicated that pilots think of workload as being related to effort. Several pilots differentiate between subjective and objective workload. The marked diversity of opinion as to the workload associated with various tasks or flight phases, e.g., landing or radio communication, is highlighted. Author (ESA)

N82-31946# Systems Research Labs., Inc., Dayton, Ohio.
THE EFFECTS OF COLOR AND CONTRAST ON TARGET RECOGNITION PERFORMANCE USING MONOCHROMATIC TELEVISION DISPLAYS M.S. Thesis
Alan R. Pinkus Wright-Patterson AFB, Ohio AMRL May 1982 46 p refs
(Contract F33615-79-C-0503; AF Proj. 7184)
(AD-A116238; AFAMRL-TR-82-9) Avail: NTIS HC A03/MF A01 CSCL 05/10

White, green, and red monochromatic television phosphors are used in a variety of military display systems, without consideration to their potential effect on an operator's target recognition performance. Since display contrast is known to have a significant effect on target recognition performance, it was also included as a variable to examine possible interaction effects. Target recognition performance was operationally defined as the visual angle (degrees) subtended by a group target, viewed via a television, at the time of recognition. Each of the twelve subjects viewed five different types of targets at four diagonal orientations, each under six television display conditions. For each trial, the target (located in the center of the television) started small and unrecognizable, then slowly enlarged until it became recognizable. At the moment of recognition, the subject pressed a projector stop button and identified the target. The experimenter then measured the target's size. Results showed that color did not significantly affect subject's target recognition performance ($p = 0.25$). Contrast was highly significant ($p < 0.001$), thereby replicating several previous studies. There was no color by contrast interaction ($p = 0.70$), but targets and color by targets were significant ($p < 0.0001$ and $p < 0.02$, respectively). GRA

N82-31893# Joint Publications Research Service, Arlington, Va.
MAIN DIRECTIONS AND PRINCIPLES OF PSYCHOLOGICAL EXPERTISE OF COSMONAUTS
K. K. Ioseliani, A. L. Narinskaya, and Sh. R. Khisambeyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 1-8 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 4-8 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-31901# Joint Publications Research Service, Arlington, Va.
CONTROLOGRAPHY USED FOR INTEGRAL ASSESSMENT OF MENTAL WORK CAPACITY
K. K. Ioseliani, A. L. Narinskaya, and Sh. R. Khisambeyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 46-49 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 32-35 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-31947# Rockwell International Corp., El Segundo, Calif.
AIRCREW WINDBLAST PROTECTION CONCEPTS, DEVELOPMENT AND EVALUATION Final Report, Oct. 1979 - Jun. 1980
R. J. Cummings and W. J. Adams Wright-Patterson AFB, Ohio Aerospace Medical Research Lab. Mar. 1982 86 p refs
(Contract F33615-79-C-0528; AF Proj. 7231)
(AD-A115424; NA-80-390; AFAMRL-TR-80-123) Avail: NTIS HC A05/MF A01 CSCL 01/3

The problem of protecting aircrews from limb injuries during high-speed ejection is addressed. Design criteria, data, and evaluation techniques that were developed to support the selection of an appropriate windblast protection device concept for the F-15 and F-16 fighter aircraft are described in detail. Several alternate arm and leg-restraint systems were designed, fabricated, and evaluated as part of the research effort. Test fixtures were designed and fabricated to simulate (1) cockpit geometry, (2) force relationships between the seat and man, (3) deployment and retraction of restraints in 0.1 second, and (4) seat/man separation dynamics. The evaluation of restraint concept performance using the prototypes, evaluation plan, and test fixtures is described.

The selection criteria to identify the best restraint designs are presented. A test and evaluation plan for airworthiness verification is described to aid follow-on engineering development efforts.
Author (GRA)

N82-31948# Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
LIFE-CYCLE COSTING OF LIFE SUPPORT EQUIPMENT Final Report, Apr. - Sep. 1980
Clifford C. Petersen, Colin L. Moodie, Jack Posey, Gary Schulties, and Jhitang Chen Dec. 1981 78 p
(Contract F33615-78-C-0627; AF Proj. 7930)
(AD-A116404; SAM-TR-81-25) Avail: NTIS HC A05/MF A01 CSCL 06/11

A feasibility study has been accomplished on applying life-cycle costing (LCC) to aircrew life support equipment (LSE). The AFLC Logistics Support Cost (LSC) model was examined and found to be too complex for application to life support devices (LSD). A potentially useful simplification of the LSC model was developed and applied to the CRU-68 oxygen regulator and the FR139 and FR140 anti-G valves, but available logistics data were insufficient for these devices. An alternate model (LCC-LSD) was developed and applied with some success. The simpler computer program requires data much more accessible from the DO41, DO39, and DO62 data systems and has a plotting capability to graph LCC vs. changes in reliability or maintainability. Sensitivity analyses showed maintenance costs to be the key area where the U.S. Air Force could achieve significant savings (perhaps $15 million).
Author (GRA)

N82-31949# Massachusetts Inst. of Tech., Cambridge. Man-Machine Systems Lab.
SUPERVISORY CONTROL: PROBLEMS, THEORY AND EXPERIMENT FOR APPLICATION TO HUMAN-COMPUTER INTERACTION IN UNDERSEA REMOTE SYSTEMS Technical Report, 1 Feb. 1981 - 31 Jan. 1982
Thomas B. Sheridan 1 Mar. 1982 144 p refs
(Contract N00014-77-C-0256; NR Proj. 196-158)
(AD-A116236) Avail: NTIS HC A07/MF A01 CSCL 17/2

This technical report provides an overview of a four-year theoretical and experimental research project on human-computer cooperation in remote control of undersea manipulators and vehicles. The report puts forth a theoretical framework for viewing supervisory control in terms of a hierarchical interaction of three fundamentally different types of control loops: (1) interaction of a human supervisor with a high level computer; (2) interaction between the high level and one or more low level computers; and (3) interaction of the low level computers with the environment as mediated through artificial sensors and effectors. The perspective is one of coordinated allocation of human and artificial resources to various functions at various levels and times within given tasks. Numerous problems are discussed in conjunction with human and computer cognition, display, command and control, matching capabilities to tasks and evaluation aspects. Experiments performed in our laboratory on human supervisory control of remote undersea manipulators, vehicles and dynamic processes are reviewed briefly in relation to the theoretical constructs. These draw upon already published detailed reports of each experiment. Author (GRA)

N82-31950# Sheffield Univ. (England). Dept. of Control Engineering.
THE BENCH MINING SYSTEM: PROGRESS IN TWO-DIMENSIONAL SIMULATION OF STEERING CHARACTERISTICS
J. B. Edwards Mar. 1982 19 p
(RR-176) Avail: NTIS HC A02/MF A01

Computer programs which simulate the vertical steering characteristics of the thick seam bench mining system were adjusted, in order to eliminate unwanted penetration of the floor. A flow chart which describes program functions needed to obtain bench fit is presented. Results for a variety of floor profiles confirm the validity of the fitting routines, so these routines were incorporated into color graphics simulation programs. Effects of interaction between roof support and bench can be incorporated into the simulation routine. Roof support and roof beam fitting routines work well for chocks with a very short front extension, but less well for long based chocks. Author (ESA)

N82-31951# Research Inst. of National Defence, Stockholm (Sweden).
READING TEXT FROM VISUAL DISPLAY UNITS
Yvonne Waern and Carl Rollenhagen (Stockholm Univ.) May 1982 38 p refs
(FOA-C-53006-H2) Avail: NTIS HC A03/MF A01

Psychological aspects of reading are reviewed, and problems faced by good readers who are unfamiliar with computers, but who have to work with visual display units (VDU) are discussed. Text processing theories and psychological investigation methodologies for factors affecting VDU operator performance are examined. Author (ESA)

N82-31900# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF FUNCTIONAL STATE OF HEAVY TRANSPORT HELICOPTER PILOTS IN THE COURSE OF FLIGHT SHIFT
Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 4, Jul. - Aug. 1982 (JPRS-81599) 20 Aug. 1982 p 42-45 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 4, Jul. - Aug. 1982 p 30-32 (For primary document see N82-31892 22-51)
Avail: Issuing Activity

N82-32298# Joint Publications Research Service, Arlington, Va.
OPTICAL FIBER MULTIPLE SENSOR FOR GRIPPING COMPLEX OBJECTS
Michel Defaux *In its* West Europe Rept.: Sci. and Technol., No. 99 (JRPS-80536) 9 Apr. 1982 p 30-31 Transl. into ENGLISH from L'Usine Nouvelle (France), 11 Feb. 1982 p 48-49 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N82-32284# Joint Publications Research Service, Arlington, Va.
COOPERATIVE EFFORT SUGGESTED FOR RESEARCH ON EXTRATERRESTRIAL LIFE
Yu. Zaytsev *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 52-54 Transl. into ENGLISH from Leningr. Pravda (USSR), 16 Feb. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N82-31952# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung deterministischer und stochastischer dynamischer Systeme.
SEMINAR ON THE LINE METHOD AND ITS APPLICATIONS [SEMINAR UEBER DIE LINIENMETHODE UND ANWENDUNGEN]
K. J. Schwenfeger, ed. Apr. 1982 164 p refs In GERMAN Proc. of the Fall Semester, 1981
Avail: NTIS HC A08/MF A01

The line method for parabolic differential equations and for the Cauchy problem in weakly coupled parabolic systems was discussed. Initial and boundary value problems by means of the line method for elliptic equations, numerical methods for stiff differential equations and numerical simulation of very large

chemical reaction systems were treated. The line method applied to the integration of partial differential equations, and on stable integration method of variable order and its application to stiff initial value problems in ordinary differential equations from thermodynamics and fluid dynamics were discussed. For individual titles, see N82-31953 through N82-31959.

N82-31953# Karlsruhe Univ. (West Germany). Mathematisches Inst. 1.
THE LINE METHOD FOR PARABOLIC DIFFERENTIAL EQUATIONS [DIE LINIENMETHODE FUER PARABOLISCHE DIFFERENTIALGLEICHUNGEN] c64
Wolfgang Walter *In* Hochschule der Bunderswehr On the Line Meth. and its Appl. Apr. 1982 p 1-24 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

The application of the line method to parabolic differential equations is explained. A convergence theory in which it is assumed that a solution of the parabolic problem with certain properties is available is described. The extension to the Cauchy problem and other problems with infinite surface leads to infinite systems of ordinary differential equations. A constructive existence theory which does not use assumptions about the parabolic problem, but yields a solution from line method approximations, is presented. Author (ESA)

N82-31954# Karlsruhe Univ. (West Germany). Mathematisches Inst. 1.
THE LINE METHOD FOR THE CAUCHY PROBLEM IN WEAKLY COUPLED PARABOLIC SYSTEMS [DIE LINIENMETHODE FUER DAS CAUCHY-PROBLEM BEI SCHWACH GEKOPPELTEN PARABOLISCHEN SYSTEMEN] c64
Dietrich Wendland *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 25-42 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

The application of the longitudinal line method of the Cauchy problem in weakly coupled parabolic systems of differential equations resulted in an initial value problem for a system of differential equations. It is shown under which assumptions the solvability of the initial value problem is sufficient for the solvability of the Cauchy problem, and the existence question of the Cauchy problem can be reduced to the existence question of the initial value problem. Author (ESA)

N82-31955# Georgia Inst. of Tech., Atlanta. School of Mathematics.
INITIAL AND BOUNDARY VALUE PROBLEMS BY MEANS OF THE LINE METHOD FOR ELLIPTIC EQUATIONS [ANFANGS- UND RANDWERTAUFGABEN BEI DER LINIENMETHODE FUER ELLIPTISCHE GLEICHUNGEN] c64
Guenter H. Meyer *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 43-58 refs In GERMAN (For primary document see N82-31952 22-59)
(Contract DAAG-79-C-0145)
Avail: NTIS HC A08/MF A01

The line method was applied to elliptic differential equations. Problems with free boundary were emphasized. A simple and generally useable convergence proof for the iterative solution of the ordinary differential equations whereby the series converge monotonically was found. The unequivocalicity of the solution was investigated. A typical obstacle problem was numerically solved. Author (ESA)

N82-31956# Heidelberg Univ. (West Germany). Abt. Numerische Mathematik.
NUMERICAL METHODS FOR STIFF DIFFERENTIAL EQUATIONS: ORDER, STABILITY AND IMPLEMENTABILITY [NUMERISCHE METHODEN FUER STEIFE DIFFERENTIALGLEICHUNGEN ORDNUNG, STABILITAET UND IMPLEMENTIERBARKEIT] c64
Ernst Hairer *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 59-70 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

Stability of linear differential equations, contractivity of nonlinear differential equations, correlation between order and stability, and semi-implicit methods are discussed. Author (ESA)

N82-31957# Heidelberg Univ. (West Germany). Abt. Numerische Mathematik.
NUMERICAL SIMULATION OF VERY LARGE CHEMICAL REACTION SYSTEMS [NUMERISCHE SIMULATION SEHR GROSSER CHEMISCHER REAKTIONSSYSTEME] c25
Peter Deuflhard *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 71-75 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

Very large chemical reaction systems were numerically simulated by means of the Jacobi matrix method. These systems are mathematically represented by ordinary stiff differential equations with polynomial right hand side. Software packages with a stiff integrator as main routine are described. Author (ESA)

N82-31958# Gesellschaft fuer Reaktorsicherheit, Garching (West Germany). Abt. Mathematik.
THE LINE METHOD APPLIED TO THE INTEGRATION OF PARTIAL DIFFERENTIAL EQUATIONS [ANWENDUNGEN DER LINIENMETHODE BEI DER INTEGRATION PARTIELLER DIFFERENTIALGLEICHUNGEN] c64
W. Werner *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 76-117 In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

The application of the line method and the simulation of complex physical processes represented by partial differential equations, are described. For the numerical integration of these equations, a semidiscrete approximation was used, which is discrete in space and continuous in time, converting the initial boundary value problems for partial differential equation systems into initial value problems for ordinary differential equation systems. Author (ESA)

N82-31959# Gesellschaft fuer Reaktorsicherheit, Garching (West Germany). Abt. Mathematik.
AN A (ALFA)-STABLE INTEGRATION METHOD OF VARIABLE ORDER AND ITS APPLICATION TO STIFF INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS FROM THERMODYNAMICS AND FLUID DYNAMICS [EIN A-STABILES INTEGRATIONSVERFAHREN VARIABLER ORDNUNG UND SEINE ANWENDUNG AUF STEIFE ANFANGSWERTPROBLEME BEI GEWOEHNLICHEN DIFFERENTIALGLEICHUNGEN UND THERMO- UND FLUIDDYNAMIK] c64
Eduard Hofer *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 118-158 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

A generally usable numerical integration method (FEBE) for the application of the line method in simulation problems of thermodynamics and fluid dynamics is presented. This FEBE method allows the integration of big initial value problems in ordinary differential equations. Its domains of absolute stability are considerably better for oscillatory stiff problems. It is based on a combination of forward and backward Euler discretization with local extrapolation. Applications in thermodynamics and fluid dynamics show the practiality of FEBE. Author (ESA)

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N82-31960# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

FUNDAMENTALS OF MATHEMATICAL ANALYSIS FOR DIGITAL COMPUTERS, VOLUME 2 [FUNDAMENTOS DE ANALISE NUMERICA PARA COMPUTADORES DIGITAIS VOLUME 2]
Carlos Jose Zamlutti Feb. 1982 192 p refs In PORTUGUESE; ENGLISH summary
(INPE-2327-MD/017) Avail: NTIS HC A09/MF A01

Under the denomination of direct methods, a set of methods is collected for the theory of approximations. The set is characterized by the possibility of obtaining, a priori, the amount of work required for a derived accuracy. In the methods presented, the quality can be determined directly by the approximated error limits. Author

N82-31961# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CONSTRUCTION OF THE WEFAX/INPE CONVERTER [CONSTRUCAO DO CONVERSOR WEFAX/INPE]
Helcio Aranha and Renato Tank Feb. 1982 103 p refs In PORTUGUESE; ENGLISH summary
(INPE-2334-NTE/180) Avail: NTIS HC A06/MF A01

A complete description of the WEFAX/INPE converter for processing signals from the GEOS and METEOSAT geostationary satellites is presented. The converter receives signals at 1690.1 MHz and converts them to 135.6 MHz, providing signal compatible with the APT image reception system. Assembly and adjustment procedures applicable to industrial scale production are provided. A description and schematics for the entire system from the 3 m diameter paraboloid antenna to the display device producing the images are given. Conversion, input, and control units are described. Transl. by J.D.

N82-31962# California Univ., Livermore. Lawrence Livermore Lab.
DEDICATED EPROM-BASED COMPUTER FOR DISTRIBUTED INSTRUMENTATION CONTROL
David N. Hunt and Dennis W. OBrien 14 Oct. 1981 6 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003153; UCRL-86022; CONF-811012-31) Avail: NTIS HC A02/MF A01

The LLNL Nuclear Chemistry Counting Facility (NCCF) is being converted to a modern production facility. A computer network was designed and built to implement this conversion. The outermost node of the computer network is a dedicated EPROM-based controller. The controller handles the details of driving the attached nuclear instrumentation, providing a standard interface to the remainder of the network. The design and the implementation of the dedicated instrumentation controller is discussed. DOE

N82-31963# California Univ., Livermore. Lawrence Livermore Lab.
TOWARDS A GENERALIZED COMPUTER CONTROL SYSTEM: AN ANALYSIS
Glenn Speckert, Charles Grant, and Doug Guenther (Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif.) 22 Oct. 1981 6 p refs Presented at the 9th Symp. on Eng. Problems of Fusion Res., Chicago, 26-29 Oct. 1981
(Contracts W-7405-eng-48; N60921-80-WR-W0188; DARPA Order 3718)
(DE82-003149; UCRL-86339; CONF-811040-107) Avail: NTIS HC A02/MF A01

Computerized control systems have been written for a variety of complex but similar machines, notably large fusion experiments and accelerators. A number of independent software solutions have emerged as a result, each tailored to their specific control application. A general software structure may exist which can be used in many control environments. A preliminary analysis of the structure of control systems and a strategy for a control system which can be used for a wide domain of target machines are presented. DOE

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-31964# Oak Ridge National Lab., Tenn. UCND Computer Sciences Div.
DOMINO-2, A GENERAL PURPOSE CODE FOR COUPLING DOT-IV DISCRETE ORDINATES AND MONTE CARLO RADIATION TRANSPORT CALCULATIONS
M. B. Emmett May 1981 14 p refs Sponsored by Defense Nuclear Agency
(Contract W-7405-eng-26)
(ORNL/TM-7771) Avail: NTIS HC A02/MF A01

The DOMINO computer program was rewritten to allow processing of a DOT-IV multiple boundary source tape. The DOT-IV tape can contain either I-boundary sources, J-boundary sources, or both; but in the latter case DOMINO can process only one of the types in a given run. As with the previous version, there are four types of DOMINO tapes that may be written for use by a Monte Carlo code. A detailed discussion of the differences in this code and the previous one is included. Author

N82-31965*# Sikorsky Aircraft, Stratford, Conn.
COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS PROGRAM MANUAL MANUAL. VOLUME 1: USER'S AND PROGRAMMER'S INSTRUCTIONS Final Report
S. Cassarino and R. Sopher Jun. 1982 212 p refs Sponsored in part by ARMY 2 Vol.
(Contract NAS1-16058)
(NASA-CR-165891; NAS 1.26:165891) Avail: NTIS HC A10/MF A01 CSCL 09B

user instruction and software descriptions for the base program of the coupled rotor/airframe vibration analysis are provided. The functional capabilities and procedures for running the program are provided. Interfaces with external programs are discussed. The procedure of synthesizing a dynamic system and the various solution methods are described. Input data and output results are presented. Detailed information is provided on the program structure. Sample test case results for five representative dynamic configurations are provided and discussed. System response are plotted to demonstrate the plots capabilities available. Instructions to install and execute SIMVIB on the CDC computer system are provided. Author

N82-31966*# Sikorsky Aircraft, Stratford, Conn.
COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS PROGRAM MANUAL. VOLUME 2: SAMPLE INPUT AND OUTPUT LISTINGS Final Report
S. Cassarino and R. Sopher Jun. 1982 263 p refs Sponsored in part by ARMY 2 Vol.
(Contract NAS1-16058)
(NASA-CR-165892; NAS 1.26:165892) Avail: NTIS HC A12/MF A01 CSCL 09B

Sample input and output listings obtained with the base program (SIMVIB) of the coupled rotor/airframe vibration analysis and the external programs, G400/F389 and E927 are presented. Results for five of the base program test cases are shown. They represent different applications of the SIMVIB program to study the vibration characteristics of various dynamic configurations. Input and output listings obtained for one cycle of the G400/F389 coupled program are presented. Results from the rotor aeroelastic analysis E927 also appear. A brief description of the check cases is provided. A summary of the check cases for all the external programs interacting with the SIMVIB program is illustrated. Author

N82-31967*# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.

MULTILEVEL SEMANTIC ANALYSIS AND PROBLEM-SOLVING IN THE FLIGHT DOMAIN Final Report, 11 Jul. 1981 - 10 Jul. 1982

R. T. Chien, D. C. Chen, W. P.-C. Ho, and Y. C. Pan Aug. 1982 111 p refs

(Contract NCC1-52)

(NASA-CR-169282; NAS 1.26:169282; T-117) Avail: NTIS HC A06/MF A01 CSCL 09B

A computer based cockpit system which is capable of assisting the pilot in such important tasks as monitoring, diagnosis, and trend analysis was developed. The system is properly organized and is endowed with a knowledge base so that it enhances the pilot's control over the aircraft while simultaneously reducing his workload. S.L.

N82-31968*# SKF Technology Services, King of Prussia, Pa. Technology Services Div.

HIGH SPEED CYLINDRICAL ROLLER BEARING ANALYSIS. SKF COMPUTER PROGRAM CYBEAN. VOLUME 2: USER'S MANUAL Final Report

G. J. Dyba and R. J. Kleckner Jun. 1981 147 p refs

(Contract NAS3-22690)

(NASA-CR-165364; NAS 1.26:165364; SKF-AT81D049-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 09B

CYBEAN (CYlindrical BEaring ANalysis) was created to detail radially loaded, aligned and misaligned cylindrical roller bearing performance under a variety of operating conditions. Emphasis was placed on detailing the effects of high speed, preload and system thermal coupling. Roller tilt, skew, radial, circumferential and axial displacement as well as flange contact were considered. Variable housing and flexible out-of-round outer ring geometries, and both steady state and time transient temperature calculations were enabled. The complete range of elastohydrodynamic contact considerations, employing full and partial film conditions were treated in the computation of raceway and flange contacts. The practical and correct implementation of CYBEAN is discussed. The capability to execute the program at four different levels of complexity was included. In addition, the program was updated to properly direct roller-to-raceway contact load vectors automatically in those cases where roller or ring profiles have small radii of curvature. Input and output architectures containing guidelines for use and two sample executions are detailed. R.J.F.

N82-31969*# SKF Technology Services, King of Prussia, Pa.

RESEARCH REPORT: USER'S MANUAL FOR COMPUTER PROGRAM AT81Y003 SHABERTH. STEADY STATE AND TRANSIENT THERMAL ANALYSIS OF A SHAFT BEARING SYSTEM INCLUDING BALL, CYLINDRICAL AND TAPERED ROLLER BEARINGS Final Report

G. B. Hadden, R. J. Kleckner, M. A. Ragen, and L. Sheynin May 1981 254 p refs

(Contract NAS3-22690)

(NASA-CR-165365; NAS 1.26:165365; SKF-AT81DO40) Avail: NTIS HC A12/MF A01 CSCL 09B

The SHABERTH program is capable of simulating the thermomechanical performance of a load support system consisting of a flexible shaft supported by up to five rolling element bearings. Any combination of ball, cylindrical, and tapered roller bearings can be used to support the shaft. The user can select models in calculating lubricant film thickness and traction forces. The formulation of the cage pocket/rolling element interaction model was revised to improve solution numerical convergence characteristics. S.L.

N82-31970*# SKF Technology Services, King of Prussia, Pa.

RESEARCH REPORT: USER'S MANUAL FOR COMPUTER PROGRAM AT81Y005. PLANETSYS, A COMPUTER PROGRAM FOR THE STEADY STATE AND TRANSIENT THERMAL ANALYSIS OF A PLANETARY POWER TRANSMISSION SYSTEM Final Report

G. B. Hadden, R. J. Kleckner, M. A. Ragen, G. J. Dyba, and L. Sheynin May 1981 142 p refs

(Contract NAS3-22690)

(NASA-CR-165366; NAS 1.26:165366; SKF-AT81DO44) Avail: NTIS HC A07/MF A01 CSCL 09B

The material presented is structured to guide the user in the practical and correct implementation of PLANETSYS which is capable of simulating the thermomechanical performance of a multistage planetary power transmission. In this version of PLANETSYS, the user can select either SKF or NASA models in calculating lubricant film thickness and traction forces. Author

N82-31971*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A GENERALIZED MEMORY TEST ALGORITHM

Edward J. Milner Jul. 1982 11 p refs

(NASA-TM-82874; E-1250; NAS 1.15:82874) Avail: NTIS HC A02/MF A01 CSCL 09B

A general algorithm for testing digital computer memory is presented. The test checks that (1) every bit can be cleared and set in each memory work, and (2) bits are not erroneously cleared and/or set elsewhere in memory at the same time. The algorithm can be applied to any size memory block and any size memory word. It is concise and efficient, requiring the very few cycles through memory. For example, a test of 16-bit-word-size memory requries only 384 cycles through memory. Approximately 15 seconds were required to test a 32K block of such memory, using a microcomputer having a cycle time of 133 nanoseconds. Author

N82-31972# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A TRANSLATOR FOR THE SEQUEL 2/QUERY LANGUAGE M.S. Thesis - 1981 [UM TRADUTOR PARA A LINGUAGEM SEQUEL 2/QUERY]

Olga Maria deOliveira Mar. 1982 75 p refs In PORTUGUESE; ENGLISH summary

(INPE-2351-TDL/083) Avail: NTIS HC A04/MF A01

The project and construction of the data interfaces for Burroughs' machines (series B7000/B6000) relational data base system, called Sistema Relacional are described. The system simplifies the users' data access. This system is supported by the Burroughs' DMS 2 package. In the Sistema Relacional, information retrievel is accomplished with the high-level SEQUEL 2/QUERY language. J.M.S.

N82-31973# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SPATIAL FEATURE EXTRACTION IN MULTISPECTRAL IMAGES M.S. Thesis [EXTRACAO E ATRIBUTOS ESPACIAIS EM IMAGENS MULTIESPECTRAIS]

Luciano Vieira Dutra Feb. 1982 97 p refs In PORTUGUESE; ENGLISH summary

(INPE-2315-TDL/078) Avail: NTIS HC A05/MF A01

Feature extraction is an important factor in determining the precision that can be attained on the classification of multispectral images. The traditional point by point classification methods do not use all the available information since they disregard the spatial relationship that exists among pixels belonging to the same class. Methods are developed to extract image spatial features by means of liner and nonlinear filtering. Feature selection methods are also developed, since it is not possible to use all the generated features because physical restrictions, computational costs and availability of training patterns do not allow the manipulation of a large number of extracted image features. The classifier that is used assumes that the features have a Gaussian distribution although the use of nonlinear filters does not guarantee the normality of the resulting features. Therefore, nonlinear transfer functions are employed as an attempt to restore the Gaussian character of the involved features. The analysis of the performance of the spatial features in conjunction with the spectral ones demonstrated that the use of spatial information increases the precision of the classifications. S.L.

N82-31974# Kaman Aerospace Corp., Bloomfield, Conn.

DYNAMIC SYSTEM COUPLING (DYSCO) PROGRAM. VOLUME

1: USER'S MANUAL Final Technical Report
A. Berman Fort Eustis, Va. Army Research and Technology Labs. Apr. 1982 40 p 2 Vol.
(Contract DAAK51-79-C-0046; DA Proj. 1L1-62209-AH-76)
(AD-A115003; R-1649-Vol-1;
USAAVRADCOM-TR-81-D-42A-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

Dynamic System Coupling (DYSCO) is a computer program which allows an interactive user to couple arbitrary components and force algorithms into a model of a helicopter or other dynamic system. The equations of the system may then be solved by a choice of analytical methods. The components available are rigid blade rotor, elastic fuselage, rotor control system, and other structures representable by general linear second-order differential equations. The force methods available are linear rotor loads, tabular rotor aerodynamics with optional induced velocity map, fuselage flat plate drag, and sinusoidal shaker. The solution methods available are time history, linear constant coefficient eigenanalysis, and complex frequency response. The program has the capability of being expanded in its level of complexity by the addition of other technology modules. Author (GRA)

N82-31975# Kaman Aerospace Corp., Bloomfield, Conn.
DYNAMIC SYSTEM COUPLING (DYSCO) PROGRAM. VOLUME 2: THEORETICAL MANUAL Final Report
A. Berman Fort Eustis, Va. Army Research and Technology Labs. Apr. 1982 84 p 2 Vol.
(Contract DAAK51-79-C-0046; DA Proj. 1L1-62209-AH-76)
(AD-A115004; R-1649-Vol-2;
USAAVRADCOM-TR-81-D-42B-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

Dynamic System Coupling (DYSCO) is a computer program which allows an interactive user to couple arbitrary components and force algorithms into a model of a helicopter or other dynamic system. The equations of the system may then be solved by a choice of analytical methods. The components available are rigid blade rotor, elastic fuselage, rotor control system, and other structures representable by general linear second-order differential equations. The force methods available are linear rotor loads, tabular rotor aerodynamics with optional induced velocity map, fuselage flat plate drag, and sinusoidal shaker. The solution methods available are time history, linear constant coefficient eigenanalysis, and complex frequency response. The program has the capability of being expanded in its level of complexity by the addition of other technology modules. Author (GRA)

N82-31976# Naval Civil Engineering Lab., Port Hueneme, Calif.
SEADYN: PROGRAMMER'S REFERENCE MANUAL Final Report, Oct. 1977 - Sep. 1981
Ronald L. Webster Port Hueneme, Calif. Naval Civil Engineering Lab. Apr. 1982 93 p refs
(Contract N62474-81-C-9391; YF59556091)
(AD-A115011; NCEL-CR-82.018) Avail: NTIS HC A05/MF A01 CSCL 13/10

The internal workings of the SEADYN cable, truss, and mooring program are detailed. Descriptions are given of the overall program structure and logic. Storage features, such as COMMON, data files, and variable dimensioning are discussed. Descriptions are given for each of the subroutines and the major variables used. the information provided is intended to augment the general description of the program provided in the User's Manual and Mathematical Models and provide a programmer with assistance in understanding the internal workings of the SEADYN programming. Instructions for converting the program to various machines and for modifying the program are also provided. Author (GRA)

N82-31977# Cornell Univ., Ithaca, N. Y. Dept. of Education.
COMPUTER INSTRUMENTATION FOR RESEARCH ON THE COGNITIVE STRUCTURES AND PROCESSES REQUIRED TO EXECUTE PROCEDURES BASED ON INSTRUCTIONS Technical Report, 1 Feb. - 31 May 1982
David E. Stone and Margaret L. Minn May 1982 19 p refs
(Contract N00014-80-C-0372)
(AD-A115469; TR-8-SER-B; TR-7) Avail: NTIS HC A02/MF A01 CSCL 05/9

Research on the cognitive structures and processes required to execute procedures based on instructions has, until very recently, focused on the delivery of Instructions in print. However, the advent of computer systems designed to deliver procedural training and job-aiding information has led us to conduct research on the use of computers for communicating procedures. The power of computers makes this type of presentation fundamentally different from print media and the growing use of computer-based training and job-aiding systems in the military also makes them worthy of study. In this report we describe a system for displaying interactive computer generated color text, graphics, and symbols and computer-controlled video and videodisc displays for use in our research. The computer system selected for use in our research is the TICCIT system. This is a commercially available system now in widespread use in military, industrial, and civilian educational settings. TICCIT is an officially designated Navy device (Device 4E7). This report is intended to provide a description of our instrumentation and thereby make our subsequent reports of experiments more understandable to the reader. Author (GRA)

N82-31978# System Development Corp., Dayton, Ohio.
THE USER-ASSISTED AUTOMATED EXPERIMENTAL (TEST), DESIGN PROGRAM (AED): VERSION 1
Edwin G. Meyer, Constance M. Hoyland, and Robert G. Mills Wright-Patterson AFB, Ohio Aerospace Medical Research Labs. Feb. 1982 121 p refs
(Contract F33615-79-C-0505; AF Proj. 7184)
(AD-A115518; AFAMRL-TR-81-100) Avail: NTIS HC A06/MF A01 CSCL 09/2

The large number of factors commonly encountered in simulation and live field test programs dictates that a large (and costly) experimental program be run if the classical full factorial experimental design is employed. Through the use of a screening process involving a sequential design, efficient economical pilot studies can be conducted, leading to a reduction in the number of factors and the size of the experimental space. Fractional factorial designs are used in the pilot studies. The experimental data provide guidance to the experimenter in terms of removing nonsignificant factors and thus reducing the size of the experimental space. This report documents the initial design, development, and use of an interactive computer program to aid in the development of fractional factorial experimental designs. Fractional factorial experiments are a special class of experimental procedures that allow the user to perform a smaller number of experiments than would be required in the usual experimental procedures and which maximize information return while minimizing the number of observations (tests) required. The overall experimental design philosophy is described and a brief introduction into the theory of experimental design is presented. The Appendix describes how the computer program was constructed and how it should be used. A specific example related to the MISVAL (Missile Launch Envelope Technology Program) is included. Author (GRA)

N82-31979# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
INFOSAM: A SAMPLE DATABASE MANAGEMENT SYSTEM
Bruce Blumberg Dec. 1981 333 p refs
(Contract N00039-81-C-0663)
(AD-A116593; CISR-M010-8112-07; CISR-TR-7) Avail: NTIS HC A15/MF A01 CSCL 09/2

The design and implementation of a relational database management system called INFOSAM is described. Its design incorporates the concept of hierarchical decomposition, whereby the system is organized into levels or groups of modules which share a common function or view of the data. The levels are hierarchically related such that a given level is largely implemented through the services provided by the next lower level. INFOSAM incorporates 3 major levels, which are primarily distinguished by their view of the data. They are the External level, the Nset level and the Internal level. The objective of this stratification is to

provide a high degree of data independence for the user, and a low level of functional redundancy in the system. Author

N82-31980# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
SHELL: A SIMULATOR FOR THE SOFTWARE TEST VEHICLE OF THE INFOPLEX DATABASE COMPUTER
Tak To and Stuart E. Madnick Jan. 1982 170 p refs
(Contract N00039-81-C-0663)
(AD-A116592; CISR-M010-8201-08; CISR-TR-8) Avail: NTIS HC A08/MF A01 CSCL 09/2

The INFOPLEX database computer is a special computer designed for large scale information management. The information management functions are decomposed into a functional hierarchy implemented by a hierarchy of micro-processors. Decentralized control mechanisms are used to coordinate the activities of individual modules in the hierarchy. Before realizing INFOPLEX in hardware, it is essential to validate all the design details via a software test vehicle (STV). A simulator (SHELL) is built to provide the necessary facilities for the operating of this software test vehicle. It has two parts: an event simulator which simulates the operation of the afore mentioned hardware configuration; and an operating system emulator which provides the environment for testing the multi-threading, parallel processing application programs. SHELL is meant to be used as the Control Structure portion of the STV project, which includes two additional parts, the Functional Hierarchy STV and the Storage Hierarchy STV.
Author (GRA)

N82-31981# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
FSTV: THE SOFTWARE TEST VEHICLE FOR THE FUNCTIONAL HIERARCHY OF THE INFOPLEX DATABASE COMPUTER
Meichun Hsu Jan. 1982 274 p refs
(Contract N00039-81-C-0663)
(AD-A116591; CISR-M010-8201-09; CLSR-TR-9) Avail: NTIS HC A12/MF A01 CSCL 09/2

This report describes in detail the current implementation of the Software Test Vehicle (STV) for the Functional Hierarchy of the INFOPLEX database computer. The purpose of STV is to provide a better understanding of the architecture and functionalities of the INFOPLEX design by emulating its architecture and simulating its functionalities in software. It aims at validating the communication protocols among its various components, tightening functional algorithms for database management and data movements, providing behavioral and preliminary performance information concerning the architecture, and serving as a test bed before realizing the design in the hardware prototype. Implementation of FSTV is based on a preliminary design of the Functional Hierarchy presented in Hsu80. In that design, data base management functions are decomposed into hierarchical levels, each level to be implemented as a level of the Functional Hierarchy. The current version of FSTV is implemented with special attention paid to a richer set of data base capabilities and architectural compatibility. Author (GRA)

N82-31982# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Automatic Data Processing Center.
PRIMER ON COMPUTER GRAHICS PROGRAMMING
Apr. 1982 232 p Prepared in cooperation with Military Academy
(AD-A116257; WES-INSTRUCTION-K-82-3) Avail: NTIS HC A11/MF A01 CSCL 09/2

This report is a tutorial for learning graphics programming with the Graphics Compatibility System (GCS). GCS is a collection of ANSI standard FORTRAN subroutines invocable by a user's FORTRAN program. The report cover's GSC's capabilities. GSC can produce a simple line drawing or handle comprehensive general purpose axis creation and automatic clipped; arc and conic generation; graphics input; secondary coordinate systems; multiple software character fonts; data structures; segmentation; and color. The report addresses both two- and three-dimensional graphics capability within GCS. GRA

N82-31983# Army War Coll., Carlisle Barracks, Pa.
MUTUAL PROBLEM SOLVING THROUGH COMPUTER TIME SHARING
Robert J. Knez 16 Apr. 1982 45 p refs
(AD-A116718) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper suggests the use of an on-on computer time sharing system acting in the role of a communications facility serving a community of subscribers who pose problems and tender solutions to one another anonymously. Subscribers to the system may be categorized by professional or academic discipline. They may also be aligned through the creation of associations which the computer will recognize. Subscribers may direct their problems to members of select disciplines, associations or by general broadcast. The system is intended to work throught the mutual cooperation of its anonymous subscribers who are encouraged to make effective contributions by the mutual benefits to be gained as well as through a status based incentive system. Author (GRA)

N82-31984# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
INVESTIGATE CAPABILITY OF ADA HIGHER ORDER PROGRAMMING LANGUAGE FOR DEVELOPING MACHINE INDEPENDENT SOFTWARE Final Technical Report
L. J. Gallaher Griffiss AFB, N.Y. RADC Mar. 1982 110 p refs
(Contract F30602-78-C-0120; AF Proj. 5581)
(AD-A116070; RADC-TR-82-46) Avail: NTIS HC A06/MF A01 CSCL 09/2

In this investigation of the ability of ADA to support machine independent software, a library package of the elementary mathematical functions (sin, cos, en, etc.) was implemented and tested on the ADA/ED Compiler Version 11/4. The ADA language constructs proved quite useful and effective in creating the math function package. The programs were written and successfully syntax checked; however, flaws in this version of the compiler prevented a thorough debugging of these routines. The routines were designed to be machine and accuracy independent. Accuracy independence was obtained using variable length polynomials whose coefficients are computed (at compile time) from Chebyshev series. For increased efficiency, the normally machine dependent operations (bit picking) are isolated into subroutines that can be optimized for individual installations and hardware. Author (GRA)

N82-31985# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
COMBINED HW/SW RELIABILITY MODELS Final Technical Report, Feb. 1980 - Feb. 1981
L. E. James, J. E. Angus, J. B. Bowen, and J. McDaniel Griffiss AFB, N.Y. RADC Apr. 1982 158 p refs
(Contract F30602-80-C-0085; AF Proj. 2338)
(AD-A116566; HAC-FR-81-16-351A; RADC-TR-82-68) Avail: NTIS HC A08/MF A01 CSCL 09/2

A general methodology is developed for combining hardware and software reliability. Based on this general methodology, a baseline combined HW/SW reliability was developed incorporating and unifying the SW reliability theory of Jelinski-Moranda, Goel-Okumoto with traditional HW reliability theory. The baseline model is computerized and includes various HW/SW failure and repair characteristics, allowance for imperfect SW debugs and modes of HW/SW interaction. Finally a HW/SW tradeoff procedure is developed using a combined HW/SW availability measure. Examples are provided to illustrate the general theory and tradeoff procedure. Author (GRA)

N82-31986# Hughes Research Labs., Malibu, Calif.
ADVANCED IMAGE UNDERSTANDING Interim Technical Report, 1 Apr. 1980 - 30 Sep. 1981
G. R. Nudd and S. D. Fouse Wright-Patterson AFB, Ohio AFWAL Dec. 1981 97 p refs
(Contract F33615-80-C-1080; AF Proj. 3119)
(AD-A116237; AFWAL-TR-82-1095) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes ongoing work on the development of RADIUS, a real-time image understanding system which is well

suited to VLSI. In addition to the development work, several related tasks are discussed including developing an interface between a PDP 11/34 and the RADIUS processor, investigating further applications of residue arithmetic to image understanding, and developing an integrated design automation capability that will allow us to design and simulate LSI and VLSI circuits. Future work will include further development of the RADIUS processor and the development of the local area logic processor. When they are both complete we will have an integrated pixel level processor that can perform a wide range of functions in real-time and many more functions in near real-time. An interface to the PDP 11 for the integrated RADIUS-LOGIC processor will also be developed, and this will allow all pixel operations to be performed at high speed, reducing greatly the CPU time needed for image understanding programs. GRA

N82-31987# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
HIDDEN SURFACE REMOVAL THROUGH OBJECT SPACE DECOMPOSITION M.S. Thesis
Robert Monroe Simmons Jan. 1982 126 p refs
(AD-A116745; AFIT/NR-82-7T) Avail: NTIS HC A07/MF A01 CSCL 12/1

Hidden surface removal is a computer graphics problem involving a great deal of computation. The problem involves two facets: determining which objects should appear in front of others (prioritization), and elimination of invisible portions of the objects through geometric calculations. Prioritization is accomplished using object space decomposition, which divides object space in a binary fashion such that the objects in a scene (or critical portions of those objects) occupy unique sub-volumes of the object space. An octal-tree is used to map the decomposition, and a simple traversal of the tree, with minor interruptions for more sophisticated decision-making, results in a stream of objects in priority order. The second phase of the hidden surface problem, removal of invisible portions of objects, often requires a great deal of computation. Parallel processing offers potential for savings in response time, and the second part of this thesis investigates a number of algorithms which attempt to take advantage of inherent concurrency. Three algorithms are presented: a quad-tree image space decomposition algorithm, a purely geometric algorithm, and an algorithm which combines ideas from the first two.
Author (GRA)

N82-31988# California Univ., Berkeley. Lawrence Berkeley Lab.
APPLICATIONS OF A NATURAL-STYLE DATABASE QUERY LANGUAGE TO STATISTICAL DATABASE OPERATIONS
W. J. Laubenheimer and Steven Rosenberg Sep. 1981 16 p refs Presented at the Statis. Database Management Workshop, Menlo Park, Calif., 2-4 Dec. 1981
(Contract W-7405-eng-48)
(DE82-003713; LBL-13348; CONF-811208-2) Avail: NTIS HC A02/MF A01

The FRL (Frame Representation Language) is discussed in terms of its suitability for use in database management systems. One drawback of FRL for such uses is its lack of a convenient mechanism for expressing queries, particularly for the naive user. A language which alleviates this difficulty by allowing queries to be expressed in a natural-sounding (although not actually natural) form is presented, and its uses and advantages in a statistical database environment are explored. DOE

N82-31989# Fondazione Ugo Bordoni, Rome (Italy).
THE USE OF THEORETICAL TRANSFIGURATIONS FOR THE IMPLEMENTATION OF FAST CONVOLUTIONS ON MICROPROCESSORS [USO DELLE TRASFORMATE TEORETICHE PER L'IMPLEMENTAZIONE DI CONVOLUZIONI VELOCI SU MICROPROCESSORI]
Mario Salerno (Rome Univ.) Dec. 1981 14 p refs In ITALIAN
(FUB-35-1981) Avail: NTIS HC A02

An algorithm based on the Fourier transformation, able to reduce sustantially the number of operations involved in the calculation of a discrete convolution is described. By this method both the signal and the sampled pulse response are transformed, the sequences are multiplied, and then the inverse transform gives the outlet convolution sequence. Generalized Fourier transforms, operating with whole numbers only, are used. It is shown that by the use of these transformations, only shift operations are required, and no round-up errors are involved. Author (ESA)

N82-31990# Fondazione Ugo Bordoni, Rome (Italy).
THE REPRESENTATION OF COMMUNICATION PROTOCOLS: AN ALGORITHM TO TRANSFORM FINITE STATE MACHINES IN PETRI NETS [SULLA RAPPRESENTATIONE DEI PROTOCOLLI DI COMUNICAZIONE: UN ALGORITMO DI TRASFORMAZIONE DI MACCHINE A STATI FINITI IN RETI DI PETRI]
Achille Pattavina and Sebastiano Trigila Apr. 1982 24 p refs In ITALIAN
(FUB-6-1982) Avail: NTIS HC A02/MF A01

A general correspondance between a finite state machine model and a Petri net model was established in order to develop an automatic procedure to transform a finite state machine model of the communication protocols in a Petri net model. The correspondance is based on the concept of attainable graphs, i.e., a representation of the global dynamic evolution of a Petri net. An algorithm to generate attainable graphs is proposed, and a correspondance between the Petri net obtained in that way and the finite state machine is identified. An automatic computer transformation procedure is proposed and an application example is given. Author (ESA)

N82-31991# Research Inst. of National Defence, Linkoeping (Sweden).
A PRESENTATION OF TWO MODELS FOR PICTORIAL EDGE DETECTION
Ulf Nilsson, Sten Nyberg, and Jan-Olof Eklundh May 1982 29 p refs
(FOA-C-30275-E1) Avail: NTIS HC A03/MF A01

Algorithms in which an edge detector operates on the image three times, varying the size of the Gaussian operator, are presented. By comparing the different outputs, the number of possible edge points can be reduced. In the first algorithm, different types of thresholding of each output, and of a combination of the three outputs, are used. The second algorithm assumes that a blurred edge can be treated as a sharp edge convolved with a Gaussian point spread function. This assumption leads to a system of equations with three equations and two unknowns: the magnitude of the edge, and the value of sigma for the point spread function. If the system of equations can be solved, the point is treated as an edge point, unless the magnitude and sigma fail to pass given thresholds. Outputs for three different pictures are presented. Author (ESA)

N82-31992# Science Research Council, Chilton (England).
PE2D USER GUIDE, 2D/AXISYMMETRIC STATIC AND DYNAMIC ELECTROMAGNETIC ANALYSIS PACKAGE, VERSION 6
C. S. Biddlecombe, N. J. Diserens, C. P. Riley, and J. Simkin 1981 80 p
(PB82-161530; RL-81-089) Copyright. Avail: NTIS HC A05 CSCL 09B

PE2D is a suite of computer programs for solving, by the finite element method, problems which can be described by two dimensional equations of the Laplacian, Poissonian, Helmholtz or diffusion types.Such problems occur in magnetostatics, electrostatics, temperature and Newtonian fluid flow, and electromagnetics with low frequency, steady state or transient eddy currents. Because of the large amount of data needed for finite element analysis, and the large set of solution values obtained, the data preparation and output retrieval sections of the program are interactive, and connect to the analysis sections via a file store interface. Most of this user guide consists of a detailed description of the facilities for data preparation and output retrieval available in the pre- and post-processor. The interface to the analysis programs is also described. The details of the program necessarily vary from computer to computer. GRA

N82-31993# National Bureau of Standards, Washington, D.C. Systems and Software Technology Div.
COMPILER-BASED PROGRAMMING SUPPORT CAPABILITIES Final Report
Gary Bray, Roger Lipsett, William Vail, and Victor Berman Jan. 1982 72 p refs Prepared in cooperation with Intermetrics, Inc. (Contract NB79-SBCA-0131)
(PB82-154378; NBSIR-81-2423) Avail: NTIS HC A04/MF A01 CSCL 09B

An effort to determine a set of features offered by program analysis and testing tools that could be feasibly implemented in a compiler is reported. Currently, program analysis and testing tools offer features that require syntactical analysis of a program in a manner similar to compilers. Much of the information that is generated during compilation could be used to aid program development in other ways. It was the goal of this effort to identify a set of software tool features and develop a methodology for combining these into a compiler. GRA

N82-31994# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
A MULTIDIMENSIONAL SCALE-TELESCOPED FILTER AND DATA EXTENSION PACKAGE
J. A. Leise Oct. 1981 25 p refs
(PB82-164104; NOAA-TM-ERL-WPL-82; NOAA-81120702) Avail: NTIS HC A02/MF A01 CSCL 09B

Versatile and efficient data processing methods (filter and data extension algorithms, complete with FORTRAN subroutines) are presented. Foremost among the features of the filter is its versatility; it is adaptable to different scale sizes; rectangular windows are possible. Also, it smooths up to the boundaries of a (multidimensional) data set. The function of data extension is to complete or fill in regions of missing data; it is used to interpolate/extrapolate missing values. The extension method is an averaging technique that tends to the sample mean as the distance from the good data increases. Author (GRA)

N82-31995# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DATA GENERAL CORPORATION ECLIPSE C/350 AOS HCOBOL REVISION 1.00 (COBOL TECHNICAL REPORT)
30 Oct. 1981 12 p
(PB82-164146; FCTC-81-37) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the Indexed I-O level module of the Data General Corp. ECLIPSE C/350 AOS HCOBOL Revision 1.00 running under AOS Revision 3.40/INFOS Revision 4.10 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the (*MODULES VALIDATED*) of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report Validation Summary Report FCTC-81/119 provides information regarding the validation of the compiler at the High-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N82-31996# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
IBM CORPORATION IBM 370 DOS/VS COBOL RELEASE 3 Validation Summary Report
30 Sep. 1981 53 p
(PB82-164153; FCTC-81-106) Avail: NTIS HC A04/MF A01 CSCL 09B

A consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1) is provided. The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed are included. GRA

N82-31997# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
FOUR-PHASE SYSTEMS, INC., FOUR-PHASE 4/90 MODEL 2 COBOL 1974 RELEASE BE04
1 Oct. 1981 51 p
(PB82-164161; FCTC-81-109) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the FOUR-PHASE IV/90 Model II COBOL '74 Release BE04 running under the MFE/IV Release BN03 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module with X3.23-1974, a section relating the categories of discrepanies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-31998# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DATA GENERAL CORPORATION ECLIPSE C/350 AOS HCOBOL REVISION 1.00
30 Oct. 1981 67 p
(PB82-164195; FCTC-81-119) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Data General Corp. ECLIPSE C/350 AOS HCOBOL Revision 1.00 running under the AOS Revision 3.40/INFOS Revision 4.10 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-31999# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
ELECTRONIC DATA SYSTEMS IBM OS/VS COBOL RELEASE 2.3
30 Oct. 1981 74 p
(PB82-164203; FCTC-81-122) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Electronic Data Systems IBM OS/VS COBOL 2.3 (Amdahl 470) running under the MVS/SE2 Release 3.8 operating system provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-32000# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
ELECTRONIC DATA SYSTEMS IBM VS FORTRAN RELEASE 1.0
30 Nov. 1981 12 p
(PB82-164211; FCTC-81-123) Avail: NTIS HC A02/MF A01 CSCL 09B

The validation Summary Report (VSR) for the Electronic Data Systems IBM VS FORTRAN Release 1.0 (Amdahl 470) Honeywell Information Systems FORTRAN CB4.1 running under the MVS/SE2 Release 3.8 operating system provides a consolidated summary

of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-32001# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
INTERNATIONAL BUSINESS MACHINES CORPORATION, IBM SERIES/1 HOST COBOL 5799 TEP, PRPQ P82648 VERSION 2 LEVEL 0, COBOL TECHNICAL REPORT
31 Aug. 1981 15 p
(PB82-155326; FCTC-81-32) Avail: NTIS HC A02/MF A01 CSCL 09B

A consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O level 1 and Sort-Merge Level 1 modules of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1) is provided. GRA

N82-32002# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HONEYWELL INFORMATION SYSTEMS COBOL CB4,1U3 B03
31 Oct. 1981 17 p
(PB82-155334; FCTC-81-35) Avail: NTIS HC A02/MF A01 CSCL 09B

A consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O levels 1 and 2, Sort-Merge level 2, Segmentation level 2 and Library level 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N82-32003*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE FINITE ELEMENT MACHINE: AN EXPERIMENT IN PARALLEL PROCESSING
O. O. Storaasli, S. W. Peebles, T. W. Crockett, J. D. Knott, and L. Adams Jul. 1982 19 p refs
(NASA-TM-84514; NAS 1.15:84514) Avail: NTIS HC A02/MF A01 CSCL 09B

The finite element machine is a prototype computer designed to support parallel solutions to structural analysis problems. The hardware architecture and support software for the machine, initial solution algorithms and test applications, and preliminary results are described. S.L.

N82-32004# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
FAULT TESTING AND PERFORMANCE MEASURING IN MICROPROCESSOR COMMUNICATION NETWORKS Ph.D. Thesis
Wafae Boghdady Oct. 1981 319 p refs
(ENST-E-81003) Avail: NTIS HC A14/MF A01

A technique for fault diagnosis in data networks, which inserts test/monitoring frames (TMF) between data frames, is presented. The TMF contents when analyzed by a test/monitoring unit located at each node, are used to detect failures, deliver the recovery, and control data flow. Implementation of the technique in a network consisting of stations interconnected by coaxial cables in a ring topology is described. Testing of front end systems, and on-line oriented testing of a microprocessor via the application programs are treated. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N82-32005# Oxford Univ. (England). Dept. of Engineering Science.
A UNIFIED APPROACH TO CONTROLLERS DESIGN FOR UNCERTAIN SYSTEMS
A. Swierniak (Silesian Tech. Univ., Poland) 1982 12 p refs
(OUEL-1406/82) Avail: NTIS HC A02/MF A01

A model of uncertain systems based on the concept of probabilistic metrics is presented. It may be considered as a generalization of probabilistic, fuzzy, set membership point to set or inequality descriptions of uncertainty. Instead of a basic model of input-output, form, an extended model which maps elements of an input space to elements of a proper Menger space is proposed. A method of the feedback control design is an extension of Drenick's, point to set approach and uses fixed point theorem proved for special contraction mappings. The conditions for a controller which assures the reachability of satisfactory neighborhood of the desired output are given. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-32006# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN EXPLICIT FINITE-DIFFERENCE SCHEME WITH EXACT CONSERVATION PROPERTIES
J. M. Sanz-Serna (Pais Vasco Univ., Lejona, Spain) Sep. 1981 22 p refs
(CSIR-TWISK-234) Avail: NTIS HC A02/MF A01

A finite-difference scheme for the numerical study of the Korteweg-deVries equation is constructed that is explicit and yet conserves exactly the energy of the computed solutions. The underlying idea can also be applied to more general equations or systems. Numerical experiments are included. Author

N82-32007# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN EXPLICIT ORDINARY DIFFERENTIAL EQUATION METHOD WITH A USEFUL STABILITY PROPERTY
J. M. Sanz-Serna (Pais Vasco Univ., Lejona, Spain) Sep. 1981 9 p refs
(CSIR-TWISK-232) Avail: NTIS HC A02/MF A01

It is proved that, for any step-size, a modified mid-point rule generates bounded sequences when applied to a family of nonlinear problems. Author

N82-32008*# Old Dominion Univ., Norfolk, Va. Research Foundation.
INTEGRATING MATRIX FORMULATIONS FOR VIBRATIONS OF ROTATING BEAMS INCLUDING THE EFFECTS OF CONCENTRATED MASSES Final Report
William D. Lakin Jun. 1982 17 p refs
(Contract NAS1-115648-58)
(NASA-CR-165954; NAS 1.26:165954) Avail: NTIS HC A02/MF A01 CSCL 12A

By expressing partial differential equations of motion in matrix notation, utilizing the integrating matrix as a spatial operator, and applying the boundary conditions, the resulting ordinary differential equations can be cast into standard eigenvalue form upon assumption of the usual time dependence. As originally developed, the technique was limited to beams having continuous mass and stiffness properties along their lengths. Integrating matrix methods are extended to treat the differential equations governing the flap, lag, or axial vibrations of rotating beams having concentrated

masses. Inclusion of concentrated masses is shown to lead to the same kind of standard eigenvalue problem as before, but with slightly modified matrices. S.L.

N82-32009*# Houston Univ., Tex. Dept. of Electrical Engineering.
RESEARCH ON NUMERICAL ALGORITHMS FOR LARGE SPACE STRUCTURES Final Report, 15 Mar. 1981 - 31 Oct. 1982
Eugene D. Denman 31 Oct. 1982 145 p refs
(Grant NsG-1603)
(NASA-CR-169279; NAS 1.26:169279) Avail: NTIS HC A07/MF A01 CSCL 12A

Numerical algorithms for large space structures were investigated with particular emphasis on decoupling method for analysis and design. Numerous aspects of the analysis of large systems ranging from the algebraic theory to lambda matrices to identification algorithms were considered. A general treatment of the algebraic theory of lambda matrices is presented and the theory is applied to second order lambda matrices. Author

N82-32010*# Wisconsin Univ., Madison. Mathematics Research Center.
FINITE DIFFERENCE METHODS FOR THE STOKES AND NAVIER-STOKES EQUATIONS
John C. Strikwerda Apr. 1982 19 p refs
(Contracts NAS1-15810; NAS1-16394; DAAG29-80-C-0041)
(NASA-CR-169218; AD-A116177; MRC-TSR-2361; NAS 1.26:169218) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presents a new finite difference scheme for the Stokes equations and incompressible Navier-Stokes equations for low Reynold's number. The scheme uses the primitive variable formulation of the equations and is applicable with non-uniform grids and non-rectangular geometries. Several other methods of solving the Navier-Stokes equations are also examined in this paper and some of their strengths and weaknesses are described. Computational results using the new scheme are presented for the Stokes equations for a region with curved boundaries and for a disc with polar coordinates. The results show the method to be second-order accurate. Author (GRA)

N82-32011# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CONCERNING THE DECOMPOSITION OF PARA-UNITARY FUNCTIONS INTO PARCELS OF UNIFORM PROOF [SOBRE A DECOMPOSICAO DAS FUNCOES PARA-UNITARIAS EM PARCELAS DE ARGUMENTO UNIFORME]
Plinio Tissi Mar. 1982 22 p refs In PORTUGUESE; ENGLISH summary
(INPE-2347-NTE/181) Avail: NTIS HC A02/MF A01

A general solution is presented for the problem of the sum-decomposition of a para-unitary function into parcels with a homogeneous phase. This problem is of great interest in radiating systems which split the spectrum among individual radiators, required to be fed exactly in phase. Several examples illustrate the application of the basic theorems presented. Author

N82-32012# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
HEURISTIC TECHNIQUES APPLIED TO PROBLEM SOLVING M.S. Thesis - 1981 [TECNICAS HEURITICAS APLICADAS A RESOLUCAO DE PROBLEMAS]
Julia Leocadia deOliveira Feb. 1982 201 p refs In PORTUGUESE; ENGLISH summary
(INPE-2314-TDL/077) Avail: NTIS HC A10/MF A01

An application of search techniques, assisted by specific knowledge of the problem domain (heuristic search) to situations where the analysis of all alternatives is impossible or not feasible is discussed. The selected search technique, the Alfa-beta pruning, generally used in implementing board games, is applied to a discrete version of differential games. A relative value V(x1, w) was defined for the proposed locally optimum game. It was possible to establish a limit for the difference between the value of the game, as defined by them, and V(x1, w). A limit was also established for the difference between states reached after the same number of decisions in two games started at the same point. As an initial application, a game of Hawaiian checkers (KONANE) was implemented. The performance of the Alfa-beta technique was studied and verified in the applications. Author

N82-32013# Wisconsin Univ., Madison. Mathematics Research Center.
A CASE STUDY OF THE ROBUSTNESS OF BAYESIAN METHODS OF INFERENCE: ESTIMATING THE TOTAL IN A FINITE POPULATION USING TRANSFORMATIONS TO NORMALITY Technical Summary Report
Donald B. Rubin May 1982 39 p refs
(Contract DAAG29-80-C-0041)
(AD-A116189; MRC-TSR-2375) Avail: NTIS HC A03/MF A01 CSCL 12/1

Bayesian methods of inference are the appropriate statistical tools for providing interval estimates in practice. The example presented here illustrates the relative ease with which Bayesian models can be implemented using simulation techniques to approximate posterior distributions but also shows that these techniques cannot be automatically applied to arrive at sound inferences. In particular, the example dramatizes three important messages. The first two messages are concrete and easily stated: Although the log normal model is often used to estimate the total on the raw scale (e.g., estimate total oil reserves assuming the logarithm of the values are normally distributed), the log normal model may not provide realistic inferences even when it appears to fit fairly well as judged from probability plots. Extending the log normal family to a larger family, such as the Box-Cox family of power transformations, and selecting a better fitting model by likelihood criteria or probability plots, may lead to less realistic inferences for the population total, even when probability plots indicate an adequate fit. In general, inferences are sensitive to features of the underlying distribution of values in the population that cannot be addressed by the data. GRA

N82-32014# Wisconsin Univ., Madison. Mathematics Research Center.
RECURSIVE PARAMETER ESTIMATION USING INCOMPLETE DATA Technical Summary Report
D. M. Titterington (Univ. Gardens, Glasgow, Scotland) May 1982 24 p refs
(Contract DAAG29-80-C-0041)
(AD-A116190; MRC-TSR-2376) Avail: NTIS HC A02/MF A01 CSCL 12/1

Stochastic approximation procedures are considered for the estimation of parameters using incomplete data. One procedure is stated and illustrated which often leads to asymptotically efficient estimators. Others are developed which, although possibly not optimal in the above sense, will be very much easier to apply. This will be particularly advantageous when quick recursive estimates are required. Examples are given and a link is made between one of the sub-optimal methods and the EM algorithm. Author (GRA)

N82-32015# Wisconsin Univ., Madison. Mathematics Research Center.
KERNEL-BASED DENSITY ESTIMATION USING CENSORED TRUNCATED OR GROUPED DATA
D. M. Titterington May 1982 21 p refs
(Contract DAAG29-80-C-0041)
(AD-A116174; MRC-TSR-2382) Avail: NTIS HC A02/MF A01 CSCL 12/1

Censoring, truncation and grouping represent different but related forms of incompleteness. Methods of producing kernel functions on the incomplete observations are proposed. They involve substituting for or averaging over the incomplete observations. Consistency of the procedures in terms of the criterion of integrated mean squared error is established and optimal choice of smoothing parameter is achieved. Author (GRA)

N82-32016# Wisconsin Univ., Madison. Mathematics Research Center.

AN ANALYTICAL, ONE-PARAMETER FAMILY OF SELF-ADJOINT BOUNDARY CONDITIONS FOR SCHROEDINGER OPERATORS ON AN INTERVAL

Robert I. Sachs Apr. 1982 9 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A116165; MRC-TSR-2357) Avail: NTIS HC A02/MF A01 CSCL 12/1

A one-parameter family of real, homogeneous boundary conditions on the interval 0,1, under which the operator -d2/dx2 is self-adjoint, is constructed. The relation between such boundary conditions and Lagrangian planes in R4 is used and the resulting circle of boundary conditions is seen to include Dirichlet, Neumann, periodic, antiperiodic, and several other well-known examples. Author

N82-32017# Wisconsin Univ., Madison. Mathematics Research Center.

INTERVAL BOUNDS FOR STATIONARY VALUES OF FUNCTIONS

L. B. Rall 5 Feb. 1982 15 p refs

(Contract DAAG29-80-C-0041)

(AD-A116166; MRC-TSR-2367) Avail: NTIS HC A02/MF A01 CSCL 12/1

A number of important problems in applied mathematics can be reduced to finding stationary values of functionals (maxima, minima, and critical values). For functionals defined in terms of integrals, the method of interval integration provides a way to obtain interval (two-sided) bounds for these stationary values. As a special case of this method, upper and lower bounds for eigenvalues of linear operators can be obtained. The inclusion of stationary values in intervals is based on the use of interval functions which include the function for which the functional is stationary, and its derivatives. A simple way to construct such interval functions is given, and examples are presented of a minimum and an eigenvalue problem. The improvement of initial results by iteration is indicated. Author

N82-32018# Wisconsin Univ., Madison. Mathematics Research Center.

BOUNDING ERROR IN REGRESSION: THE APPROPRIATENESS OF SHEPPHARD'S CORRECTIONS

Arthur P. Dempster and Donald B. Rubin Apr. 1982 23 p refs

(Contract DAAG29-80-C-0041)

(AD-A116167; MRC-TSR-2362) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider three simple approaches to rounding error in least squares regression. The first treats the rounded data as if they were unrounded, the second adds an adjustment to the diagonal of the covariance matrix of the variables, and the third subtracts an adjustment from the diagonal. The third, Sheppard's corrections, can be motivated as maximum likelihood with small rounding error and either (1) joint normal data or (2) normal residuals, regular independent variables, and large samples. Although an example and theory suggest that the third approach is usually preferable to the first two, a generally satisfactory attack on rounding error in regression requires the specification of the full distribution of variables, and convenient computational methods for this problem are not currently available. Author (GRA)

N82-32019# Wisconsin Univ., Madison. Mathematics Research Center.

EXISTENCE OF INFINITELY MANY SOLUTIONS FOR A NONLINEAR PARABOLIC EQUATION

Klaus Hoelling Mar. 1982 29 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A116155; MRC-TSR-2354) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this paper is to study the well-posedness of the model initial boundary value problem for the simplest case of a nonmonotone, piecewise linear, coercive phi which is decreasing on a single finite interval (a,b). Our result, as stated in the abstract, is that the problem has infinitely many solutions, whenever the initial function has f' > a, and therefore, the problem is apparently not well-posed in general. However, numerical computations suggest that there should be a natural way to single out a unique solution and it is hoped that imposing additional physical motivated assumptions will lead to a well-posed problem and further insight into the general situation of nonmonotone constitutive functions phi. GRA

N82-32020# Wisconsin Univ., Madison. Mathematics Research Center.

A UNIFYING NOTE ON FATOU'S LEMMA IN SEVERAL DIMENSIONS

E. J. Balder (Utrecht Univ., The Netherlands) Apr. 1982 23 p refs

(Contract DAAG29-80-C-0041)

(AD-A116156; MRC-TSR-2368) Avail: NTIS HC A02/MF A01 CSCL 12/1

A general version of Fatou's lemma in several dimensions is presented. It generalizes the Fatou lemmas given by Schmeidler (1970), Hildenbrand (1974), Cesari-Suryanarayana (1978) and Artstein (1979). Also, it is equivalent to an abstract variational existence result that extends and generalizes results by Aumann-Perles (1965), Berliocchi-Lasry (1973), Artstein (1974) and Balder (1979) in several respects. Author (GRA)

N82-32021# Wisconsin Univ., Madison. Mathematics Research Center.

THE RIEMANN PROBLEM IN TWO SPACE DIMENSIONS FOR A SINGLE CONSERVATION LAW

David H. Wagner Apr. 1982 50 p refs

(Contract DAAG29-80-C-0041)

(AD-A116154; MRC-TSR-2363) Avail: NTIS HC A03/MF A01 CSCL 12/1

Solutions are given for the partial differential equation with initial data constant in each quadrant of the (x,y) plane. This problem generalizes the Riemann Problem for equations in one space dimension. Although existence and uniqueness of solution are known, little is known concerning the qualitative behavior of solutions. When f and g are convex and f = g, then our solutions satisfy the uniqueness, or entropy conditions given by Kruzkov and Vol'pert. Under certain extra conditions on f and g, our solutions satisfy the entropy condition if f and g are convex and sufficiently close. A counterexample is given to show the necessity of these extra conditions on f and g. The correct entropy solution for this counter-example exhibits new and interesting phenomena. GRA

N82-32022# Wisconsin Univ., Madison. Mathematics Research Center.

GLOBAL EXISTENCE OF SOLUTIONS OF THE EQUATIONS OF ONE-DIMENSIONAL THERMOELASTICITY WITH INITIAL DATA IN BV AND L(1) Technical Summary Report

Jong Uhn Kim Apr. 1982 86 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A116324; MRC-TSR-2364) Avail: NTIS HC A05/MF A01 CSCL 12/1

This paper discusses the Cauchy problem associated with a particular system of equations of one-dimensional nonlinear thermoviscoelasticity with the initial data given in the class of functions of bounded variation (denoted by BV). It has been known that the class of BV is a suitable function space for the study of evolution equations which arise in continuum mechanics in order to admit solutions possessing shocks. This fact has been exploited in the analysis of hyperbolic conservation laws which describe the motion of a continuum when mechanical and thermal dissipations are neglected. On the other hand, only the smooth (classical) solutions have been studied for the equations which include such dissipative terms. Our goal is to study the global existence of weaker solutions of systems which include such dissipative terms. Our main result shows that when the initial data are sufficiently small in the Lagrangian form and BV norms, the system (1) of the abstract has global solutions in time possessing specific regularity properties. Author (GRA)

N82-32023# Wisconsin Univ., Madison. Mathematics Research Center.
FEEDBACK STABILIZATION OF HYBRID BILINEAR SYSTEMS
M. Slemrod (Rensselaer Polytechnic Inst., Troy, N.Y.) and E. L. Rogers (Rensselaer Polytechnic Inst., Troy, N.Y.) Apr. 1982 23 p refs
(Contract DAAG29-80-C-0041; Grant AF-AFOSR-0172-81)
(AD-A116323; MRC-TSR-2360) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper considers the problem of stabilizing a control system governed by a combination of partial and ordinary differential equations. The partial differential equations govern the evolution of the system in the interior of some spatial domain, the ordinary differential equations describe the evolution of the boundary data; the control enters through the boundary ordinary differential equations in a bilinear fashion. We provide sufficient conditions for feedback stabilization of such 'hybrid' systems. Two examples to wave equations with dynamic boundary conditions are provided. Author (GRA)

N82-32024# Wisconsin Univ., Madison. Mathematics Research Center.
HOMOGENEOUS AND NON-HOMOGENEOUS BOUNDARY VALUE PROBLEMS FOR FIRST ORDER HYPERBOLIC SYSTEMS ARISING IN FLUID MECHANICS, PART 2
H. Beirao DaVeiga Mar. 1982 36 p refs
(Contract DAAG29-80-C-0041)
(AD-A116322; MRC-TSR-2351) Avail: NTIS HC A03/MF A01 CSCL 12/1

We prove the existence and the uniqueness of differentiable and strong solutions for a class of boundary value problems for first order linear hyperbolic systems arising from the dynamics of compressible non-viscous fluids. In particular necessary and sufficient conditions for the existence of solutions for the non-homogeneous problem are studied; strong solutions are obtained without this supplementary condition. In particular we don't assume the boundary space to be maximal non-positive and the boundary matrix to be of constant rank on the boundary. In this paper we prove directly the existence of differentiable solutions without resort to weak or strong solutions. An essential tool will be the introduction of a space Z of regular functions verifying not only the assigned boundary conditions but also some suitable complementary boundary conditions. GRA

N82-32025# Wisconsin Univ., Madison. Mathematics Research Center.
TOPICS IN MULTIVARIATE APPROXIMATION THEORY
C. DeBoor May 1982 44 p refs
(Contract DAAG29-80-C-0041)
(AD-A116248; MRC-TSR-2379) Avail: NTIS HC A03/MF A01 CSCL 12/1

Lectures delivered at the S.R.C. Numerical Analysis Summer School and Workshop at the University of Lancaster, England, July 19 - August 20, 1981. Topics include tensor products, multivariate polynomial interpolation, esp. Kergin Interpolation, and the recent developments of multivariate B-splines. Author (GRA)

N82-32026# Wisconsin Univ., Madison. Mathematical Research Center.
THE LINEAR FINITE ELEMENT METHOD FOR A TWO-DIMENSIONAL SINGULAR BOUNDARY VALUE PROBLEM
S. Z. Zhou May 1982 19 p refs
(Contract DAAG29-80-C-0041)
(AD-A116247; MRC-TSR-2380) Avail: NTIS HC A02/MF A01 CSCL 12/1

The finite difference methods and its theory for a type of two dimensional singular boundary value problems are given. The finite element method for axisymmetric elastic solid is proposed. A proof of the convergence of the finite element methods for one dimensional singular problems is given. The 'optimal' order of convergence, provided the loads are axisymmetric and the solution is in C to the k + 1 powr (bar omega) is proven. The convergence of the linear finite element method for two dimensional singular Dirichlet problem is proved. Author

N82-32027# Wisconsin Univ., Madison. Mathematics Research Center.
WEAKLY NONLINEAR HIGH FREQUENCY WAVES
John Hunter May 1982 60 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A116246; MRC-TSR-2381) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper we derive a method for finding small amplitude high frequency solutions to hyperbolic systems of quasilinear partial differential equations. Our solution is the sum of two parts: (1) a superposition of small amplitude high frequency waves; (2) a slowly varying 'mean solution'. Each high frequency wave displays nonlinear distortion of the wave profile and shocks may form. Shock conditions are derived for conservative systems. Different high frequency waves do not interact provided the frequencies and wave numbers of two waves are not linearly related to those of a third. The mean solution is found by solving a linear partial differential equation. This method generalizes Whitham's nonlinearization technique 9 for single waves, to problems where many waves are present. We obtain these results by generalizing a scheme first proposed by Choquet-Bruhat 1 which employs the method of multiple scales. Author (GRA)

N82-32028# Wisconsin Univ., Madison. Mathematics Research Center.
SOME DATA-ANALYTIC MODIFICATIONS TO BAYES-STEIN ESTIMATION
Tom Leonard Apr. 1982 17 p refs
(Contract DAAG29-80-C-0041)
(AD-A116218; MRC-TSR-2365) Avail: NTIS HC A02/MF A01 CSCL 12/1

The usual Bayes-Stein shrinkages of maximum likelihood estimates towards a common value may be refined by taking fuller account of the locations of the individual observations. Under a Bayesian formulation, the types of shrinkages depend critically upon the nature of the common distribution assumed for the parameters at the second stage of the prior model. In the present paper this distribution is estimated empirically from the data, permitting the data to determine the nature of the shrinkages. For example, when the observations are located in two or more clearly distinct groups, the maximum likelihood estimates are roughly speaking constrained towards common values within each group. The method also detects outliers; an extreme observation will either be regarded as an outlier and not substantially adjusted towards the other observations, or it will be rejected as an outlier, in which case a more radical adjustment takes place. The method is appropriate for a wide range of sampling distributions and may also be viewed as an alternative to standard multiple comparisons, cluster analysis, and nonparametric kernel methods. Author (GRA)

N82-32029# Wisconsin Univ., Madison. Mathematics Research Center.
ESTIMATION OF VARIANCE OF THE RATIO ESTIMATOR: AN EMPIRICAL STUDY
Chien-Fu Wu and Lih-Yuan Deng May 1982 38 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-01846)
(AD-A116211; MRC-TSR-2378) Avail: NTIS HC A03/MF A01 CSCL 12/1

Several estimators of variance of the ratio estimator in simple random sampling have been proposed in Cochran (1977), Fuller (1981), Royall and Cumberland (1978), Royall and Eberhardt (1975), Wu (1982). Their performances are compared on nine populations that reflect different features of natural populations encountered in practice. One criterion is the mean square error of the variance estimator as a point estimator of the variance of ratio; the other is the reliability of the associated t-interval. Author (GRA)

N82-32030# Wisconsin Univ., Madison. Mathematics Research Center.

BIFURCATION AND OPTIMAL STOCHASTIC CONTROL
P. L. Lions (Paris Univ.) Mar. 1982 48 p refs
(Contract DAAG29-80-C-0041)
(AD-A116215; MRC-TSR-2350) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two questions concerning bifuraction theory and optimal stochastic control are considered. First, in a few examples, we give the interpretation of a bifurcation in terms of optimal stochastic control. Next, we introduce the analogue of the lowest eigenvalue for the nonlinear operator associated with the Hamilton-Jacobi-Bellman equations of Optimal Stochastic Control. Author (GRA)

N82-32031# Wisconsin Univ., Madison. Mathematics Research Center.
LOCAL EXPLICIT MANY-KNOT SPLINE HERMITE APPROXIMATION SCHEMES
D. X. Qi (Jilin Univ., Changchun, China) and S. Z. Zhou (Hunan Univ., Chansha, China) Apr. 1982 13 p refs
(Contract DAAG29-80-C-0041)
(AD-A116216; MRC-TSR-2359) Avail: NTIS HC A02/MF A01 CSCL 12/1

Some authors considered operators of the form Omega f = sigma lambda i fN i,k, where (Ni,k) is a sequence of B-splines and (lambda i) is a sequence of linear functionals. The variation diminishing method of Schoenberg (9, 5, 6), the quasi-interpolant of de Boor and Fix are well-known. Such approximation schemes have several important advantages over spline interpolation. They can be constructed directly without matrix inversion, local error bounds can be obtained naturally. Omega i considered so-called many-knot splines which have many more knots than degrees of freedom and constructed the cardinal spline Omega f = sigma f(xi)qi,k, where qi,k is made up of B-splines on a uniform partition, has small support and satisfies qi,k(xj) = sigma ij. Such an approximation operator reproduces appropriate classes of polynomials. GRA

N82-32032# Wisconsin Univ., Madison. Mathematics Research Center.
SOLUTIONS OF THE POROUS MEDIUM EQUATION IN R(N) UNDER OPTIMAL CONDITIONS ON INITIAL VALUES Technical Summary Report
Philippe Benilan, Michael G. Crandall, and Michel Pierre May 1982 49 p refs
(Contract DAAG29-80-C-0041)
(AD-A116204; MRC-TSR-2387) Avail: NTIS HC A03/MF A01 CSCL 12/1

This work establishes existence of solutions of the initial-value problem u(t) = delta (determinant u to m-1 power), u(x,0), = u(0)(x), where m > 1, under the most general conditions on u(0). Namely, u(0) need only be such that R to the minus (2 divided by m-1 +N) sum (determinant x < or = R) to the power of u(0)(x)) dx is bounded independently of R > or = 1. Aronson and Caffarelli have shown this requirement to be necessary. Many auxiliary results are given in the form of estimates on solutions, uniqueness and continuous dependence theorems, etc. While the results may be viewed as 'technical' in that the main points consist of estimates of various sorts, the equation treated is of broad practical interest and the estimates reflect basic properties of the equation. The results obtained are the only ones known to the authors wherein the solvability of a realistic nonlinear initial value problem for a partial differential equation is now understood as completely as in the case of the heat equation. GRA

N82-32033# Wisconsin Univ., Madison. Mathematical Research Center.
AN ANALYSIS OF THE p VERSION OF THE FINITE ELEMENT METHOD FOR NEARLY INCOMPRESSIBLE MATERIALS. UNIFORMLY VALID, OPTIMAL ERROR ESTIMATES Technical Summary Report
Michael Vogelius May 1982 2 p refs
(Contract DAAG29-80-C-0041)
(AD-A116205; MRC-TSR-2385) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper we analyze the behavior of the so-called p-version of the finite element method when applied to the equations of plane strain linear elasticity. We establish optimal rate error estimates that are uniformly valid, independent of the value of the Poisson ratio, nu, in the interval 0, 1/2. This shows that the p-version does not exhibit the degeneracy phenomenon which has led to the use of various, only partially justified techniques of reduced integration or mixed formulations for more standard finite element schemes and the case of a nearly incompressible material. Author (GRA)

N82-32034# Wisconsin Univ., Madison. Mathematics Research Center.
NUMERICAL COMPUTATION OF PERIODIC SOLUTION BRANCHES AND OSCILLATORY DYNAMICS OF THE STIRRED TANK REACTOR WITH A YIELDS B YIELDS C REACTIONS
Eusebius J. Doedel (Concordia Univ., Montreal) and Robert F. Heinemann Mar. 1982 34 p refs
(Contract DAAG29-80-C-0041)
(AD-A116164; MRC-TSR-2353) Avail: NTIS HC A03/MF A01 CSCL 12/1

We present a continuation technique for branches of periodic solutions which can be applied to autonomous systems for nonlinear differential equations. Coupling the technique with Hopf bifurcation expansions enables one to compute entire periodic solution branches including those with turning points and unstable solutions. We apply these methods to a continuously stirred tank reactor with consecutive A yields B yields C reactions. Our computations reveal dynamic phenomena not seen in previous reactor studies. The results include response diagrams exhibiting stable and unstable periodic branches that contain multiple turning points. The discovery of these points indicates the reactor may jump from a steady state to a periodic orbit or may jump from one periodic orbit to another. Author (GRA)

N82-32035# Wisconsin Univ., Madison. Mathematics Research Center.
QUASINONLINEAR EVOLUTION EQUATIONS
Michael G. Crandall and Panagiotis E. Souganidis Mar. 1982 45 p refs
(Contract DAAG29-80-C-0041)
(AD-A116178; MRC-TSR-2352) Avail: NTIS HC A03/MF A01 CSCL 12/1

A very substantial theory of quasilinear evolution equations, which applies to many problems of mathematical physics, has been developed by T. Kato. The theory obtains solutions of quasilinear problems via contraction mappings which are defined by means of a theory of linear evolution equations also developed by Kato. In the current work we show how existence theorems, etc. may be proved in the simplest of the settings considered by Kato via discretization in time. This method does not require an intervening linear theory and also may be viewed as giving results admittedly crude - about numerical approximation of some of Kato's examples. Since the hypothesis of quasilinearity is not used explicitly herein, we employ the term quasinonlinear for the equations dealt with. Author (GRA)

N82-32036# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PRECONDITIONING STRATEGIES OF SOLVING ELLIPTIC DIFFERENCE EQUATIONS ON A MULTIPROCESSOR M.S. Thesis
Charles Kirkland Taft, Jr. 1982 164 p refs
(AD-A116735; AFIT/NR-82-2T) Avail: NTIS HC A08/MF A01 CSCL 12/1

Choosing preconditioning strategies to accelerate a conjugate gradient algorithm for solving elliptic difference equations, suitable for implementation on a multiprocessor is discussed. The hypothetical multiprocessor considered consists of p linearly connected processors. A variety of popular preconditioning strategies for sequential machines is examined. Numerical experiments are conducted and recommendations made. Author

N82-32037# Maryland Univ., College Park. Inst. for Physical Science and Technology.
THE FINITE ELEMENT METHOD FOR PARABOLIC EQUATIONS. 1: A POSTERIORI ERROR ESTIMATION Final Report
M. Bieterman (National Inst. of Health, Bethesda, Md.) and I. Babuska Apr. 1982 74 p refs
(Contract N00014-77-C-0623)
(AD-A116610; BN-983) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this first of two papers, computable a posteriori estimates of the space discretization error in the finite element method of lines solution of parabolic equations are analyzed for time-independent space meshes. The effectivity of the error estimator is related to conditions on the solution regularity, mesh family type, and asymptotic range for the mesh size. For clarity the results are limited to a model problem in which piecewise linear elements in one space dimension are used. The results extend straightforwardly to systems of equations and higher order elements in one space dimension, while the higher dimensional case requires additional considerations. The theory presented here provides the basis for the analysis and adaptive construction of time-dependent space meshes, which is the subject of the second paper. Computational results show that the approach is practically very effective and suggest that it can be used for solving more general problems. Author (GRA)

N82-32038# Maryland Univ., College Park. Inst. for Physical Science and Technology.
A SURVEY OF A POSTERIORI ERROR ESTIMATORS AND ADAPTIVE APPROACHES IN THE FINITE ELEMENT METHOD Final Report
Ivo Babuska and Werner C. Rheinboldt (Pittsburgh Univ., Pa.) Apr. 1982 59 p refs Presented at the China-France Symp. on Finite Element Method, Beijing
(Contract N00014-77-C-0623)
(AD-A116609; BN-981) Avail: NTIS HC A04/MF A01 CSCL 12/1

In general, the objective of a computational solution of a practical problem is to obtain an acceptably accurate and reliable prediction of the behavior of the physical phenomena under study. For this computation should produce not only an approximate numerical solution but also some reliable information about its accuracy. This survey is intended to give an overview of some of the recent results that have become available about reliable, computable error estimators for finite element solutions as they exist in the design of adaptive solution procedures both in the linear as well as the nonlinear case. By necessity, the discussion had to be kept on a descriptive level and for all mathematical details we need to refer to the cited literature. GRA

N82-32039# Maryland Univ., College Park. Inst. for Physical Science and Technology.
THE FINITE ELEMENT METHOD FOR PARABOLIC EQUATIONS. 2: A POSTERIORI ERROR ESTIMATION AND ADAPTIVE APPROACH Final Report
M. Bieterman (National Inst. of Health, Behesda, Md.) and I. Babuska Apr. 1982 73 p refs
(Contract N00014-77-C-0623)
(AD-A116441; BN-984) Avail: NTIS HC A04/MF A01 CSCL 12/1

We extend in this paper the analysis of a posteriori estimates of the space discretization error presented in a previous paper (3) for time-independent space meshes. In the context of the model problem studied there, results are given relating the effectivity of the error estimator to properties of the solution, space, meshes, and manner in which the meshes change. A procedure based upon this theory is presented for the adaptive construction of time-dependent meshes. The results of some computational experiments show that this procedure is practically very effective and suggest that it can be used to control the space discretization error in more general problems. Author (GRA)

N82-32040# California Univ., Berkeley. Operations Research Center.
POLYGON-TO-CHAIN REDUCTIONS AND NETWORK RELIABILITY
A. Satyanarayana and R. Kevin Wood Mar. 1982 34 p refs
(Contract DAAG29-81-K-0160; Grant AF-AFOSR-0122-81)
(AD-A116276; ORC-RR-82-4; ARO-18195.2-MA) Avail: NTIS HC A03/MF A01 CSCL 09/5

Analysis of major importance in computer, communication and power networks. Even the simplest models lead to computational problems which are NP-hard for general networks, although polynomial-time algorithms do exist for certain network configurations such as 'ladders' and 'wheels' and for some series-parallel structures such as the well-known 'two-terminal' series-parallel networks. A class of series-parallel networks analyzed in polynomial time is discussed. A reliability-preserving graph reduction of general applicability is introduced. A linear-time algorithm for computing the reliability of any graph with a underlying series-parallel structure was produced. Author

N82-32041# California Univ., San Diego. Dept. of Electrical Engineering and Computer Sciences.
OPTICAL ANALOG AND HYBRID COMPUTER SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS Annual Report, 15 Dec. 1980 - 14 Dec. 1981
Sing H. Lee Apr. 1982 26 p refs
(Grant AF-AFOSR-0056-80; AF Proj. 2306)
(AD-A116071; AFOSR-82-0488TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

Hybrid optical electronic processing systems capable of high speed computing. Several approaches to hybrid processing were identified: (1) optical analog/electronic digital hybrids, employing either a coherent optical processor or a confocal optical feedback system, and (2) optical digital (nonlinear)/electronic digital hybrids, employing either optical parallel logic or integrated optical logic devices. These approaches are worthy of intensive study because optical computation offers the unmatched capabilities of parallelism while electronic computation is currently more flexible. Our focus, then, is to combine the powerful features of both optical and electronic computation. Author

N82-32042# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
APPLICATIONS OF A SIMPLE DYNAMICAL MODEL TO THE REACTION-PATH HAMILTONIAN: TUNNELING CORRECTIONS TO RATE CONSTANTS, PRODUCT-STATE DISTRIBUTIONS, LINE WIDTHS OF LOCAL-MODE OVERTONES, AND MODE SPECIFICITY IN UNIMOLECULAR DECOMPOSITION
Charles J. Cerjan, Shenghua Shi, and William H. Miller Jun. 1981 41 p refs Presented at the Am. Conf. on Theoret. Chem., Boulder, Colo., 21-27 Jun. 1981
(Contract W-7405-eng-48; Grant NSF CHE-79-20181)
(DE82-000773; LBL-12842; CONF-810160-1) Avail: NTIS HC A03/MF A01

The application of the combined semiclassical perturbation/infinite order sudden approximation to the reaction path Hamiltonian is discussed. A variety of phenomena in the dynamics of polyatomic molecules are addressed. DOE

N82-32043# Wisconsin Univ., Madison. Mathematics Research Center.
SENSITIVITY AND ASYMPTOTIC PROPERTIES OF BAYESIAN RELIABILITY ESTIMATES
Bernard Harris and Andrew P. Soms Apr. 1982 46 p refs
(Contracts N00014-79-C-9321; DAAG29-80-C-0041)
(AD-A116217; MRC-TSR-2370) Avail: NTIS HC A03/MF A01 CSCL 12/1

In decision theoretic approaches to estimation problems, loss functions of the type L(theta, cap theta) = determinant theta - cap theta determinant to the alpa power, alpha $>$ 0 are often employed; often alpha = 2. In many applications of reliability and life testing, such loss functions are inappropriate. Alternative loss functions which appear to be more suited to the intended

application are proposed and Bayesian estimates of the exponential parameter are obtained for these. Asymptotic expansions of such estimators are given and compared with estimators given in the literature. GRA

N82-32044# Los Alamos Scientific Lab., N. Mex.
NUMERICAL METHODS FOR NONLINEAR DIFFERENTIAL EQUATIONS
J. M. Hyman Jan. 1982 23 p refs
(Contract W-7405-eng-36)
(DE82-009542; LA-8927-MS) Avail: NTIS HC A02/MF A01

A unification and simplification of the better methods for the numerical solution of partial differential equations being developed is presented. This study is directed to scientists trained in mathematics but not necessarily in numerical analysis. Most of the new methods can be understood and classified according to how space, time, and boundary conditions are discretized and by how nonlinear algebraic equations that arise in the solution process are solved. Each point is discussed and numerical examples showing how a simple linear analysis can fail are presented. DOE

N82-32045# California Univ., Livermore. Lawrence Livermore Lab.
SIMILARITY METHODS FOR DIFFERENTIAL EQUATIONS
D. Logan Jan. 1982 60 p refs
(Contract W-7405-eng-48)
(DE82-011225; UCID-19316) Avail: NTIS HC A04/MF A01

Similarity methods for partial differential equations are introduced. The emphasis is on motivation and practical calculations involving several simple examples. The differential-geometric structure which underlies these concepts is discussed. The invariance of a partial differential equation under the action of a local, Lie group of transformation is the underlying concept. The nature of self-similar solutions; dimensional analysis and the Buckingham Pi Theorem and how dimensional arguments lead in a natural way to similarity solutions; the concept of invariance under a group of transformations and, given the group, how solutions can be constructed; how the invariance group can be calculated, and a detailed physical example taken from the area of detonation physics are included. DOE

N82-32046# Heimann G.m.b.H., Wiesbaden (West Germany). Forschungsschwerpunkt Simulation und Optimierung Deterministischer Undstochastischer dynamischer Systeme.
LECTURE ON FUNCTIONAL DIFFERENTIAL EQUATIONS [VORLESUNG UEBER FUNKTIONALDIFFERENTIALGLEICHUNGEN]
Erich Fuchs Mar. 1982 55 p refs In GERMAN
Avail: NTIS HC A04/MF A01

Retarded functional differential equations were treated. The problem is formulated and solved by means of stepwise integration. The existence theorem and the univocality of the solution are discussed. The continuation of the solution forward and backward, and the dependence of the solution on parameters is treated. The stability theory, i.e., the influence of small perturbations of the differential equation on the asymptotic behavior of the solution, is presented. Autonomous and nonautonomous retarded functional differential equations are presented. Author (ESA)

N82-31953# Karlsruhe Univ. (West Germany). Mathematisches Inst. 1.
THE LINE METHOD FOR PARABOLIC DIFFERENTIAL EQUATIONS [DIE LINIENMETHODE FUER PARABOLISCHE DIFFERENTIALGLEICHUNGEN]
Wolfgang Walter *In* Hochschule der Bunderswehr On the Line Meth. and its Appl. Apr. 1982 p 1-24 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

N82-31954# Karlsruhe Univ. (West Germany). Mathematisches Inst. 1.
THE LINE METHOD FOR THE CAUCHY PROBLEM IN WEAKLY COUPLED PARABOLIC SYSTEMS [DIE LINIENMETHODE FUER DAS CAUCHY-PROBLEM BEI SCHWACH GEKOPPELTEN PARABOLISCHEN SYSTEMEN]
Dietrich Wendland *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 25-42 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

N82-31955# Georgia Inst. of Tech., Atlanta. School of Mathematics.
INITIAL AND BOUNDARY VALUE PROBLEMS BY MEANS OF THE LINE METHOD FOR ELLIPTIC EQUATIONS [ANFANGS- UND RANDWERTAUFGABEN BEI DER LINIENMETHODE FUER ELLIPTISCHE GLEICHUNGEN]
Guenter H. Meyer *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 43-58 refs In GERMAN (For primary document see N82-31952 22-59)
(Contract DAAG-79-C-0145)
Avail: NTIS HC A08/MF A01

N82-31956# Heidelberg Univ. (West Germany). Abt. Numerische Mathematik.
NUMERICAL METHODS FOR STIFF DIFFERENTIAL EQUATIONS: ORDER, STABILITY AND IMPLEMENTABILITY [NUMERISCHE METHODEN FUER STEIFE DIFFERENTIALGLEICHUNGEN ORDNUNG, STABILITAET UND IMPLEMENTIERBARKEIT]
Ernst Hairer *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 59-70 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

N82-31958# Gesellschaft fuer Reaktorsicherheit, Garching (West Germany). Abt. Mathematik.
THE LINE METHOD APPLIED TO THE INTEGRATION OF PARTIAL DIFFERENTIAL EQUATIONS [ANWENDUNGEN DER LINIENMETHODE BEI DER INTEGRATION PARTIELLER DIFFERENTIALGLEICHUNGEN]
W. Werner *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 76-117 In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

N82-31959# Gesellschaft fuer Reaktorsicherheit, Garching (West Germany). Abt. Mathematik.
AN A (ALFA)-STABLE INTEGRATION METHOD OF VARIABLE ORDER AND ITS APPLICATION TO STIFF INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS FROM THERMODYNAMICS AND FLUID DYNAMICS [EIN A-STABILES INTEGRATIONSVERFAHREN VARIABLER ORDNUNG UND SEINE ANWENDUNG AUF STEIFE ANFANGSWERTPROBLEME BEI GEWOEHNLICHEN DIFFERENTIALGLEICHUNGEN UND THERMO- UND FLUIDDYNAMIK]
Eduard Hofer *In* Hochschule der Bundeswehr On the Line Meth. and its Appl. Apr. 1982 p 118-158 refs In GERMAN (For primary document see N82-31952 22-59)
Avail: NTIS HC A08/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-32047# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ROBUST KRIGING: A PROPOSAL
Douglas M. Hawkins and Noel Cressie (Flinders Univ.) Sep. 1981 28 p refs
(CSIR-TWISK-217) Avail: NTIS HC A03/MF A01

Geological data frequently retain their heavy-tailed but normal-like distributions even after attempts to transform them to normality. For such data, the usual linear kriging is invalid, while the completely general valid method of disjunctive kriging may be excessively

laborious. Our proposed method capitilizes on the normal center of the distribution of the data by using linear kriging on an editing of the data given. It is little more laborious than conventional linear kriging but provides good protection against the effect of data outliers. The method is also applicable to time series analysis. Author

N82-32048# Stanford Univ., Calif. Dept. of Statistics.
ON TESTS FOR EQUICORRELATION COEFFICIENT AND THE GENERALIZED VARIANCE OF A STANDARD SYMMETRIC MULTIVARIATE NORMAL DISTRIBUTION
Ashis Sen Gupta May 1982 28 p refs
(Contract N00014-75-C-0442)
(AD-A115377; SU-TR-55) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is observed that the standard multivariate normal distribution with equicorrelation coefficient, say rho, plays an important role in applied sciences. Tests for rho are derived. The likelihood ratio test is computationally cumbersome, vacuous against one-sided alternatives with positive probability and the exact distribution of the test statistic is nearly intractable. Alternatively, a test based on the best 'natural' unbiased estimator of rho is proposed. It turns out to be locally most powerful and globally unbiased against one-sided alternatives. The exact null and non-null distributions of the test statistic which are of historical interest are derived and the exact percentage points are available. Large sample approximations are also given. With constrained parameter space, a simple test for rho based on the eigen-values of the sample correlation matrix is proposed. The null and non-null asymptotic distributions of the corresponding test statistics are given and the unbiasedness of the test is studies. Finally, we present the likelihood ratio test and a simple test based on the eigen-values of the sample correlation matrix as tests for the generalized variance after establishing that they can be characterized through tests for rho. Author (GRA)

N82-32049# Wisconsin Univ., Madison. Mathematics Research Center.
INCOMPLETE DATA: ENCYCLOPEDIA ENTRY
Roderick J. A. Little and Donald B. Rubin Apr. 1982 22 p refs
(Contract DAAG29-80-C-0041)
(AD-A116188; MRC-TSR-2372) Avail: NTIS HC A02/MF A01 CSCL 12/1

Incomplete data occur commonly in the application of statistics to real data, and there exists a substantial literature on the problem. This article provides an overview of issues for the statistically knowledgeable but not necessarily statistically sophisticated reader. It is intended to appear as an entry in The Encyclopedia of Statistical Sciences. Author (GRA)

N82-32050# Wisconsin Univ., Madison. Mathematics Research Center.
SOME PROBLEMS WITH DATA FROM FINITE MIXTURE DISTRIBUTIONS
D. M. Titterington Apr. 1982 43 p refs
(Contract DAAG29-80-C-0041)
(AD-A116175; MRC-TSR-2369) Avail: NTIS HC A03/MF A01 CSCL 12/1

Finite mixture distributions arise in many statistical applications. After the basic definition of mixture distributions, many of these applications are listed, sampling models are proposed and the basic statistical problems are described. More detailed study is then made of the use of the familiar statistical methodologies in mixture decomposition, of the incorporation of mixture data into discrimination procedures and of the problems that arise in hypothesis testing. Author (GRA)

N82-32051# Florida State Univ., Tallahassee. Dept. of Statistics.
THE FUTURE OF STATISTICS AS A DISCIPLINE
Ralph A. Bradley Sep. 1981 38 p refs Presented at the 141st Ann. Meeting of the Am. Statis. Assoc., Detroit, 11 Aug. 1981
(Contract N00014-80-C-0093; RR0140501)
(AD-A116258; FSU-STATISTICS-M594) Avail: NTIS HC A03/MF A01 CSCL 12/1

Much has been written about statistics as a discipline, a science, and a profession--Good examples are the articles by Leslie Kish (1978) and H. O. Hartley (1980). All of us here would agree with these descriptions, but we would begin to disagree on elaborations, thus showing diversity of interest that can be both beneficial and divisive. Statistics has been called a mathematical science by some and an applied science by others. If statistics is a mathematical science, it stands alone as the one that postulates models for natural phenomena that must be subject to observation, verification, and refinement, the very process of scientific method. If statistics is an applied science, it differs from other applied sciences that utilize the theoretical discoveries of science in the production of new products that serve man. Statistics as an applied science is applied in the service of science itself; it serves as a tool in other scientific investigations. I believe that it is this role of statistics that attracts and generates the dedication of its practitioners. Author (GRA)

N82-32052# Pacific Northwest Lab., Richland, Wash.
TRAN-STAT STATISTICS FOR ENVIONMENTAL STUDIES, NO. 17
Nov. 1981 25 p refs
(Contract DE-AC06-76RL-01830)
(DE82-007076; PNL-SA-10069) Avail: NTIS HC A02/MF A01

Special parameter estimation techniques are discussed. Statistical methods applicable when extremes of small groups of data values are to be analyzed are discussed. DOE

N82-32053# California Univ., Livermore. Lawrence Livermore Lab.
FAST PROCEDURE FOR THE EXACT COMPUTATION OF THE PERFORMANCE OF COMPLEX PROBABILISTIC SYSTEMS
G. C. Corynen 1981 9 p Presented at the ANS/ENS Top. Meeting on Probabilistic Risk Assessment, Post Chester, N.Y., 20-23 Sep. 1981
(Contract W-7405-eng-48)
(DE82-003159; UCRL-86032; CONF-810905-26) Avail: NTIS HC A02/MF A01

A computational associated block (STOP) with which probabilistic performance measures associated with complex general systems can be computed exactly and efficiently is described. Traditionally, such performance measures have been computed by approximation and, when situations of high risk have been analyzed, specific conclusions about risks have rarely been defensible. Two steps are usually taken in such traditional analyses: first, the cut sets or paths of the system are computed, then the probabilities are estimated. With the algorithm based on STOP, not only are approximation not required for large systems, but there is no need to explicitly compute the paths or cut sets either. Using set theoretic principles, the algorithms decompose systems into disjoint parts, and the final probabilities of interest are then simply the sum of the probabilities of the parts. Cut sets and paths are produced in disjoin form as a by-product of the computation. As a result, graphs, trees, or more general systems can be analyzed directly and, due to the efficiency of the procedures, large systems whose performance could only be approximated heretofore can now be analyzed exactly. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-32054 International Institute for Applied Systems Analysis, Laxenburg (Austria).
[ACTIVITIES OF THE INTERNATIONAL SCIENTIFIC RESEARCH INSTITUTIONS] Annual Report, 1981
1981 70 p refs Original doc. contains color illustration
Copyright. Avail: Issuing Activity

Energy systems, food and agriculture, Earth resources and the environment, human settlements and services, and management sciences research is summarized. Energy needs were analyzed. National agricultural models were developed. The greenhouse effect was studied. Migration and spatial population growth patterns were analyzed. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-32055*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOLUTION OF SECOND-ORDER LINEAR SYSTEM BY MATCHED ASYMPTOTIC EXPANSIONS
Mark D. Ardema Aug. 1982 20 p refs
(NASA-TM-84246; A-8938; NAS 1.15:84246) Avail: NTIS HC A02/MF A01 CSCL 12A

Matched asymptotic expansions (MAE) are used to obtain a first order approximation to the solution of a singularly perturbed second order system. A special case is considered in which the uniform asymptotic solution obtained by MAE is shown to converge to the exact solution. Ways in which the method can be used to sole higher-order linear systems, including those which are not singularly perturbed, are also discussed. S.L.

N82-32056# Fondazione Ugo Bordoni, Rome (Italy).
ON SOME PROPERTIES OF A PARTICULAR CLASS OF MATRICES
Odoardo Brugia, Piero Filipponi, and William Wolfowicz Feb. 1982 6 p refs
(FUB-2-1982) Avail: NTIS HC A02/MF A01

A class of matrices that includes the double stochastic matrices class is considered, and it is shown that some of the already discussed properties may be seen as a particular case of a more general property which hold for any matrix belonging to the above mentioned class. The new matrices are the set of square matrices characterized by the fact that the sum of all terms in a row or a column is equal to a constant number which may be real or complex. A theorem proving the matrix properties is presented. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-32057 Defence Research Information Centre, Orpington (England).
LOW FREQUENCY DEMAGNETIZATION OF LARGE DIAMETER STEEL BARS OF HIGH COERCIVE FORCE
G. Magistrali and C. Giorcelli Mar. 1982 33 p refs Transl. into ENGLISH from La Metal. Ital. (Italy), no. 5, 1979 p 191-198
(DRIC-T-6500; BR83210) Copyright. Avail: Issuing Activity

Residual magnetism phenomena in steel bars, during and after production are outlined, and the limitation of the normal demagnetization apparatus operating at 50 Hz, due to the screening effect of the currents induced in the bar during the demagnetization, is considered. The possibilities of improvement of the magnetic field within the bar itself, using much lower frequencies is deduced, using known theories from the nondestructive method of induced currents. Prototype equipment based on these theories, was tested successfully, although relatively long times are required to reach desired magnetism levels.
Author (ESA)

N82-32058*# Alabama Univ., Huntsville. School of Science and Engineering.
UAH/NASA WORKSHOP ON FLUIDS EXPERIMENT SYSTEM
John Hendricks, ed. and Barbara Askins, ed. (NASA. Marshall Space Flight Center) 1979 261 p refs Proceedings of workshop in Huntsville, Ala., 11-12 Jul. 1979
(NASA-TM-82492; NAS 1.15:82492) Avail: NTIS HC A12/MF A01 CSCL 20L

The Fluids Experiment System is being developed to fit into a Spacelab rack. Papers presented at this workshop describe a variety of fluid and chemical experiments that would be of great benefit to researchers of processes in a low gravity environment. For individual titles, see N82-32059 through N82-32079.

N82-32059*# Gelles (S. H.) Associates, Columbus, Ohio.
PHASE SEPARATION IN TRANSPARENT LIQUID-LIQUID MISCIBILITY GAP SYSTEMS **c34**
S. H. Gelles, B. N. Bhat, and R. J. Laub (Ohio State Univ., Columbus) *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 3-17 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01

A program to be carried out on transparent liquid-phase miscibility gap materials was developed for the purpose of acquiring additional insight into the separation process occurring in these systems. The transparency feature allows the reaction to be viewed directly through light scattering and holographic methods. L.F.M.

N82-32060*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
MEASUREMENT OF DIFFUSION COEFFICIENTS FROM SOLUTION RATES OF BUBBLES **c34**
Irvin M. Krieger *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 18-20 ref (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

The rate of solution of a stationary bubble is limited by the diffusion of dissolved gas molecules away from the bubble surface. Diffusion coefficients computed from measured rates of solution give mean values higher than accepted literature values, with standard errors as high as 10% for a single observation. Better accuracy is achieved with sparingly soluble gases, small bubbles, and highly viscous liquids. Accuracy correlates with the Grashof number, indicating that free convection is the major source of error. Accuracy should, therefore, be greatly increased in a gravity-free environment. The fact that the bubble will need no support is an additional important advantage of Spacelab for this measurement. Author

N82-32061*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INVESTIGATIONS ON TRANSPARENT LIQUID-MISCIBILITY GAP SYSTEMS **c34**
L. L. Lacy, G. Nishioka, and S. Ross (Rensselaer Polytechnic Inst., Troy, N.Y.) *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 21-35 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

Sedimentation and phase separation is a well known occurrence in monotectic or miscibility gap alloys. Previous investigations indicate that it may be possible to prepare such alloys in a low-gravity space environment but recent experiments indicate that there may be nongravity dependent phase separation processes which can hinder the formation of such alloys. Such phase separation processes are studied using transparent liquid systems and holography. By reconstructing holograms into a commercial-particle-analysis system, real time computer analysis can be performed on emulsions with diameters in the range of 5 micrometers or greater. Thus dynamic effects associated with particle migration and coalescence can be studied. Characterization studies on two selected immiscible systems including an accurate determination of phase diagrams, surface and interfacial tension measurements, surface excess and wetting behavior near critical solution temperatures completed. Author

N82-32062*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.

MEASUREMENT OF SURFACE VELOCITY FIELDS c34
J. Adin Mann, Jr. *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 36-42 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

A new technique for measuring surface velocity fields is briefly described. It determines the surface velocity vector as a function of location and time by the analysis of thermal fluctuations of the surface profile in a small domain around the point of interest. The apparatus now being constructed will be used in a series of experiments involving flow fields established by temperature gradients imposed along a surface. L.F.M.

N82-32063*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
SURFACE TENSION DRIVEN CONVECTION c34
Simon Ostrach *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 43-51 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

In a normal gravitational environment, the free surface of a liquid in a container plays a passive role in the transport processes. However, at microgravity, the free surface can become the dominant factor. A simple but meaningful spaceflight experiment is proposed to investigate the nature and extent of flows induced by surface-tension gradients along the free surface. The influences of container geometry, wetability, contamination, and imposed heating modes will be investigated. Author

N82-32064*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.
THE MIGRATION OF FLUID DROPLETS AND THEIR INTERACTIONS IN A THERMAL GRADIENT c34
R. S. Subramanian and W. R. Wilcox *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 53-57 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20D

When materials are processed in free fall, buoyant forces will be substantially reduced. Thus, the buoyant migration of droplets and bubbles which normally occurs on earth is expected to be overshadowed by migration due to other mechanisms in space processing. In particular, capillary forces on droplets due to the variation of interfacial tension around their periphery will play a significant role in governing their motion in space. While such interfacial tension gradients can be caused by thermal, compositional, and/or electrical gradients in the continuous phase, thermal gradients are convenient to use in controlled experimentation. On earth, due to interference from buoyant effects, it is difficult to study thermocapillary migration in sufficient detail. Also, the effects of a thermal gradient on the interactions among droplets are hard to study on Earth. Thus, an orbital facility for conducting experiments on the migration and interactions of fluid droplets in a continuous phase due to the action of a thermal gradient appears attractive. Author

N82-32065*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry.
FORMATION OF METALLIC AND METAL HYDROUS OXIDE DISPERSIONS c25
Egon Matijevic and R. S. Sapieszko *In* Alabama Univ. UAH/NASA Workshop of Fluids Expt. System 1979 p 59-94 refs (For primary document see N82-32058 22-70)
(Grants NSF CHE-77-02185; NSF ENG-75-08403; EPRI Proj. RP-966-1)
Avail: NTIS HC A12/MF A01 CSCL 07D

The formation, via hydrothermally induced precipitation from homogeneous solution, of a variety of well-defined dispersions of metallic and hydrous metal in the conditions under which the particles are produced (e.g., pH and composition of the growth medium, aging temperature, rate of heating, or degree of agitation) can be readily discerned by following changes in the mass, composition, and morphology of the final solid phase. The generation of colloidal dispersions in the absence of gravity convection or sedimentation effects may result in the appearance of morphological modifications not previously observed in terrestrially formed hydrosols. Author

N82-32066*# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
FLOCCULATION OF COLLOIDAL SOLS: DIFFUSION-CONTROLLED VS AGITATION-INDUCED FLOCCULATION c27
In Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 95-102 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 11G

A proposal for carrying out flocculation experiments in microgravity is presented. These experiments might allow a correlation between theory and experiment. First, all particles, whether single primary particles or aggregates of primary particles would not settle or cream at any agitation rate, or even in the absence of agitation. This failure to separate would keep all aggregates active, still serving as centers for diffusion-controlled flocculation. Keeping all particles suspended would allow the possibility of determining the total number of particles as a function of time from beginning to end of flocculation. Finally, the experiments would allow a definite separation diffusion-controlled and agitation-induced flocculation by studying diffusion-controlled flocculation with and without agitation. L.F.M.

N82-32067*# British Columbia Univ., Vancouver. Dept. of Pathology.
CELL PARTITION IN TWO PHASE POLYMER SYSTEMS c27
D. E. Brooks *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 104-115 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 11G

Aqueous phase-separated polymer solutions can be used as support media for the partition of biological macromolecules, organelles and cells. Cell separations using the technique have proven to be extremely sensitive to cell surface properties but application of the systems are limited to cells or aggregates which do not significantly while the phases are settling. Partition in zero g in principle removes this limitation but an external driving force must be applied to induce the phases to separate since their density difference disappears. We have recently shown that an applied electric field can supply the necessary driving force. We are proposing to utilize the NASA FES to study field-driven phase separation and cell partition on the ground and in zero g to help define the separation/partition process, with the ultimate goal being to develop partition as a zero g cell separation technique. Author

N82-32068*# Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.
SOME POTENTIAL BLOOD FLOW EXPERIMENTS FOR SPACE c52
Giles R. Cokelet, Herbert J. Meiselman (Univ. of Southern California, Los Angeles), and Harry L. Goldsmith (Univ. Medical Clinic, Montreal) *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 116-123 refs Sponsored in part by DOE (For primary document see N82-32058 22-70)
(Grant NIH-HL-233355)
(UR-3490-1720) Avail: NTIS HC A12/MF A01 CSCL 06P

Blood is a colloidal suspension of cells, predominantly erythrocytes, (red cells) in an aqueous solution called plasma. Because the red cells are more dense than the plasma, and because they tend to aggregate, erythrocyte sedimentation can be significant when the shear stresses in flowing blood are small. This behavior, coupled with equipment restrictions, has prevented certain definitive fluid mechanical studies from being performed with blood in ground-based experiments. Among such experiments, which could be satisfactorily performed in a microgravity environment, are the following: (1) studies of blood flow in small tubes, to obtain pressure-flow rate relationships, to determine if increased red cell aggregation can be an aid to blood circulation, and to determine vessel entrance lengths, and (2) studies of blood flow through vessel junctions (bifurcations), to obtain information on cell

distribution in downstream vessels of (arterial) bifurcations, and to test flow models of stratified convergent blood flows downstream from (venous) bifurcations. Author

N82-32069*# City of Hope Medical Center, Duarte, Calif. Div. of Neurosciences.
GEOMETRICAL CONSIDERATIONS IN THE SEPARATION OF BIOLOGICAL PARTICLES BY AFFINITY PARTITIONING c51
Steven D. Flanagan *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 124-129 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 06C

A theoretical description of the affinity partitioning effect is presented. Experiments at reduced and zero g are discussed. N.W.

N82-32070*# Alabama Univ., Huntsville. Dept. of Chemistry.
CRYSTALLIZATION OF BIOLOGICAL MACROMOLECULES IN A REDUCED GRAVITY ENVIRONMENT c76
Edward J. Meehan, Jr. *In its* UAH/NASA Workshop on Fluids Expt. System 1979 p 131-135 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

A battery of micro techniques were developed which allow the screening of a large number of conditions using only a small amount of the macromolecule. The need to develop methodologies for growing large crystals required for neutron diffraction studies is discussed. N.W.

N82-32071*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLOW AND THERMAL EFFECTS IN CONTINUOUS FLOW ELECTROPHORESIS c25
D. A. Saville (Princeton Univ., N.J.), P. H. Rhodes, and R. S. Snyder *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 136-145 ref (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 07D

In continuous flow electrophoresis the axial flow structure changes from a fully developed rectilinear form to one characterized by meandering as power levels are increased. The origin of this meandering is postulated to lie in a hydrodynamic instability driven by axial (and possibly lateral) temperature gradients. Experiments done at MSFC show agreement with the theory. Author

N82-32072*# Paris Univ. (France). Lab. de Mineralogie Cristallographie.
CRYSTAL GROWTH BY PRECIPITATION UNDER MICROGRAVITY c76
A. Authier, F. Lefaucheux, and M. C. Robert *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 147-153 refs Sponsored in part by CNES (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

The importance of understanding the mechanisms associated with defect generation during growth and the influence of gravity is stressed. An experiment is described. The advantages of adapting this experiment to the FES are then discussed. A brief survey of the ground based research under way is given. Author

N82-32073*# Stanford Univ., Calif. Center for Materials Research.
MORPHOLOGICAL STABILITY OF A CRYSTAL GROWING IN SOLUTION c76
Dennis Elwell *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 154-159 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

A brief outline is given of the problem of the stability of growth of a polyhedral crystal growing in solution in the presence of supersaturation inhomogeneity. An experiment is proposed for a low gravity environment which should provide data for confrontation with the various theoretical approaches to this problem. The validity of this data rests on the assumption that growth occurs in a convection-free environment. Author

N82-32074*# State Univ. of New York at Buffalo, Amherst. Dept. of Chemical Engineering.
ANOMALOUS GROWTH OF SINGLE ICE CRYSTALS IN SOLUTION c76
William N. Gill *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 160-169 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

It is shown that major discrepancies exist between experiments and theory for ice crystal growth from solution. Accurate data, taken in a microgravity environment, approximate analytical models, and exact (probably numerical) models all are needed to advance our understanding of ice crystal growth phenomena. A new approximate semi-empirical theory is presented which predicts that a relatively sharp transition from natural convection control to diffusion control for ice growth in pure water occurs at a subcooling of about 10 C (a reduced temperature difference of about 0.125). No reliable data exist to test this prediction. The theory also predicts qualitatively the growth of ice in NaCl solution in which maxima in the growth rates are observed at various levels of subcooling. Author

N82-32075*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
CONVECTIVE FLOW DURING DENDRITIC GROWTH c76
M. E. Glicksman and S. C. Huang *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 170-190 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

A review is presented of the major experimental findings obtained from recent ground-based research conducted under the SPAR program. Measurements of dendritic growth at small supercoolings indicate that below approximately 1.5 K a transition occurs from diffusive control to convective control in succinonitrile, a model system chosen for this study. The key theoretical ideas concerning diffusive and convective heat transport during dendritic growth are discussed, and it is shown that a transition in the transport control should occur when the characteristic length for diffusion becomes larger than the characteristic length for convection. The experimental findings and the theoretical ideas discussed suggest that the Fluid Experiment System could provide appropriate experimental diagnostics for flow field visualization and quantification of the fluid dynamical effects presented here. Author

N82-32076*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
LOW DIMENSIONAL MAGNETIC SOLIDS AND SINGLE CRYSTAL ELPASOLITES: NEED FOR IMPROVED CRYSTAL GROWING TECHNIQUES c76
Mary L. Good, Steven Watkins, and Robert W. Schwartz *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 191-210 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

The need for extensive crystal growing experiments to develop techniques for preparing crystals suitable for magnetic anisotropy measurements and detailed X-ray and neutron diffraction studies is rationalized on the basis of the unique magnetic properties of the materials and their hydrogen bonded structures which have many features in common with metalloenzyme and metalloprotein active sites. Single crystals of the single and mixed lanthanide species are prepared by the Bridgeman technique of gradient solidification of molten samples. The effects of crystal imperfections on the optical properties of these materials are an important part of the projected research. A series of a-amido acid complexes of first row transition metals were prepared which crystallize as infinite linear chains and exhibit low dimensional magnetic ordering (one or two) at temperature below 40 K. Author

N82-32077*# Desert Research Inst., Reno, Nev. Atmospheric Sciences Center.
INFLUENCE OF CONVECTION ON FREE GROWTH OF DENDRITE CRYSTALS FROM SOLUTION **c76**
J. Hallett and E. Wedum *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 211-224 refs (For primary document see N82-32058 22-70)
(Grants NSF AER-75-19601; NSF ATM-77-07995)
Avail: NTIS HC A12/MF A01 CSCL 20L

The free growth of dendrites in a uniformly supercooled solution was examined using cine photography with a Schlieren optical system. Crystals were grown in the bulk of the solution from a centrally located capillary tube, nucleated at the interface with a liquid nitrogen cooled wire. Crystals propagated along the tube, the slower growing orientations eliminated, and emerged at the tip, usually growing parallel to the tube direction. For both sodium sulfate decahydrate from its solution and ice from sodium chloride solution, growth rate and fineness of dendrites increased with supercooling. In sodium sulfate, upward convection of the less dense depleted solution occurs; downward convection was observed for the rejected, more concentrated sodium chloride solution. In both cases, there was a spatial and temporal delay in the release of the convective plume from the moving dendrite tip. The role of this convection on the growth characteristics and the production of secondary crystals is examined. A proposed low-g experiment to examine differences in growth rate, crystal texture, and secondary nucleation in a reduced convective regime where molecular diffusion is the dominant transfer process is discussed. Author

N82-32078*# Utah Univ., Salt Lake City. Dept. of Physics.
CONVECTIVE AND MORPHOLOGICAL INSTABILITY IN VAPOR CRYSTAL GROWTH **c76**
F. Rosenberger *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 225-232 refs (For primary document see N82-32058 22-70)
(Grants NsG-1534; NSF DMR-79-13183)
Avail: NTIS HC A12/MF A01 CSCL 20L

Theoretical and experimental work on the fluid dynamics of physical vapor transport is reported. It is shown that diffusion in viscous interaction with container walls leads to concentration gradients normal to the main transport direction. Consequently any convection threshold is removed. This coupling with convective instabilities makes the theoretical interpretation of earthbound (anisotropic) morphological stability studies on vapor-solid interfaces intractable. Hence low-gravity experiments are suggested that will allow for the establishment of morphological stability criteria under diffusion controlled conditions. Author

N82-32079*# Pennsylvania State Univ., University Park. Lab. of Materials Research.
CRYSTAL GROWTH OF SULFIDE MATERIALS FROM ALKALI POLYSULFIDE LIQUIDS **c76**
William B. White *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 233-240 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

The fluids experiment system was designed for low temperature solution growth, nominally aqueous solution growth. The alkali polysulfides, compositions in the systems Na2S-S and K2S-S form liquids in the temperature range of 190 C to 400 C. These can be used as solvents for other important classes of materials such as transition metal and other sulfides which are not soluble in aqueous media. Among these materials are luminescent and electroluminescent crystals whose physical properties are sensitive functions of crystal perfection and which could, therefore, serve as test materials for perfection improvement under microgravity conditions. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N82-32080*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NOISE IMPACT OF PROPOSED RUNWAY ALTERNATIVES AT CRAIG AIRPORT
Richard DeLoach Jun. 1982 36 p refs
(NASA-TM-84503; NAS 1.15:84503) Avail: NTIS HC A03/MF A01 CSCL 20A

Four proposed runway expansion alternatives at Craig Airport in Jacksonville, Florida have been assessed with respect to their forecasted noise impact in the year 2005. The assessment accounts for population distributions around the airport and human subjective response to noise, as well as the distribution of noise levels in the surrounding community (footprints). The impact analysis was performed using the Airport-noise Levels and Annoyance Model (ALAMO), an airport community response model recently developed at Langley Research Center. Author

N82-32081*# California Univ., Los Angeles.
AEROSOUND FROM CORNER FLOW AND FLAP FLOW
W. C. Meecham Jul. 1982 41 p refs Prepared in cooperation with Mechanics Development Co., Pacific Palisades, Calif.
(Contract NAS2-10590)
(NASA-CR-166396; NAS 1.26:166396) Avail: NTIS HC A03/MF A01 CSCL 20A

Noise generation at the edge of a wing flap is analyzed. The phenomenon as a single vortex moving around a corner in an incompressible, potential flow is modelled. Vortex image retarding effects are proposed as an explanation for small Strouhal numbers. The model surface pressures, sound pressures (using Curle's theory), and Mach number dependencies agree with wind tunnel experiments. A double pressure peak is found in the model (credited to image action) which is qualitatively similar to measured sound correlations. Incompressible flow aerosound calculations are discussed. The effects of a series of vortices moving in the same idealized potential flow are also studied. The vortices are assumed to be statistically independent so their intensities can be added. The frequency of appearance of the vortices are determined from measurements. Diffraction effects caused by the presence of the wing near the dipole sound radiators on the flap surfaces are included. S.L.

N82-32082*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROUGH ANALYSIS OF INSTALLATION EFFECTS ON TURBOPROP NOISE
Paul A. Durbin and John F. Groeneweg 1982 17 p refs Proposed for Presentation at the Acoust. Soc. of Am., Orlando, Fla., 8-12 Nov. 1982
(NASA-TM-82924; E-1316; NAS 1.15:82924) Avail: NTIS HC A02/MF A01 CSCL 20A

A rough analysis of noise from a propeller operated at angle of attack, and in the nonuniform flow due to a line vortex approximating a wing flow field suggests installation can significantly affect turboprop noise levels. On one side of the propeller, where the blades approach the horizontal plane from above, decreases of noise occur; while on the other side noise increases. The noise reduction is due to negative interference of steady and unsteady sources. An angle of attack, or distance between propeller and vortex, exists for which noise is a minimum. Author

N82-32083# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
HELICOPTER NOISE DEFINITION REPORT UH-60A, S-76, A-109, 206-L Final Report
J. Steven Newman, Edward J. Rickley (DOT, Cambridge, Mass.), and David W. Ford Dec. 1981 687 p
(AD-A116363; DOT/FAA/EE-81/16) Avail: NTIS HC A99/MF A01 CSCL 20/1

This document presents noise data for the Sikorsky UH-60A Blackhawk, the Sikorsky S-76 Spirit, the Agusta A-109 and the Bell 206-L. The acoustical data are accompanied by phototheodolite tracking data, cockpit instrument panel photo data, and meteorological data acquired from radiosonde balloons. Acoustical metrics include both noise certification metrics (EPNL, PNLT, PNL) as well as community/airport noise assessment metrics (SEL, dBA). Noise data have been acquired systematically to identify variations in level with variations in helicopter airspeed and altitude. Data contained in this report provide essential information for development of helicopter noise exposure contours as well as further evaluation of ICAO helicopter noise certification standards. Accordingly, this information will be of interest to helicopter manufacturers, airport planning consultants, acoustical engineers and airport managers. This report serves as a noise definition document establishing baseline acoustical characteristics of the test helicopters. Author (GRA)

N82-32084# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
A DESCRIPTION OF METHODOLOGIES USED IN ESTIMATION OF A A-WEIGHTED SOUND LEVELS FOR FAA ADVISORY CIRCULAR AC-36-3B
Jan. 1982 114 p refs
(AD-A116543; FAA-EE-82-1; DOT/FAA/AEE-82-1) Avail: NTIS HC A06/MF A01 CSCL 20/1

This report provides a description of the assumptions, methodologies and techniques employed in arriving at estimated sound levels for many of the aircraft included in FAA Advisory Circular AC-36-3B. AC 36-3B was published to provide the public and the aviation community with comparative sound level information for aircraft currently in use. Detailed noise estimation data sheets are provided for 78 aircraft types. A table showing the difference between EPNL and dB(A) for selected jet aircraft is also provided. Author (GRA)

N82-32085# Naval Research Lab., Washington, D. C. Systems Engineering and Advanced Concepts Branch.
FREQUENCY DISPERSION OF SOUND IN UNDERSEA PROPAGATION Interim Report
A. A. Gerlach, K. D. Flowers, R. B. Johnson, Jr., W. L. Anderson, and E. L. Kunz 17 Jun. 1982 53 p refs
(XF59552091)
(AD-A116105; NRL-8600) Avail: NTIS HC A04/MF A01 CSCL 20/1

Acoustic dispersion in a deep ocean channel is characterized by the dependence of sound propagation speed on signal frequency along the axial propagation path. A model normal-mode solution of the wave equation is employed to compute the acoustic field for sinusoidal signals as a function of both axial range and frequency. A virtual propagation time is defined, which reflects the range-dependent phase of the acoustic field. When signals of different frequency are transmitted, the remotely observed frequency ratio (for a given range-rate) will fluctuate about the true frequency ratio of the transmitted signals. The magnitude of the fluctuation is directly proportional to the true frequency ratio. A measure of the spectral dispersion is defined as the difference between the observed and true frequency ratios. The dependence of this measure on range and signal frequencies (for a given frequency ratio) is determined to be relatively insignificant. It is concluded that spectral acoustic dispersion in a deep ocean channel is microscopic, but it can be significant for applications involving the phase correlation of broadband (or spectrally separated) signals over long time intervals. Author (GRA)

N82-32086# California Univ., Livermore. Lawrence Livermore Lab.
NEW DEVELOPMENTS IN PHOTOACOUSTICS
Allan Rosencwaig Jul. 1981 34 p refs Presented at the 9th Intern. Conf. on Atomic Spectroscopy, Tokyo, 4-8 Sep. 1981
(Contract W-7405-eng-48)
(DE82-000640; UCRL-86490; CONF-810977-1) Avail: NTIS HC A03/MF A01

Developments in the fields of photoacoustics and photoacoustic spectroscopy are described. Photoacoustic techniques are now used in ferromagnetic and electron spin resonance experiments. Advances in Fourier transform infrared photoacoustic spectroscopy are discussed. In addition, the calorimetric aspects of photoacoustics are now being extensively exploited for phase transition studies, and to perform thermal wave imaging and microscopy. DOE

N82-32087# Hughes Research Labs., Malibu, Calif.
REFLECTION ACOUSTIC MICROSCOPE MEASUREMENT TECHNOLOGY Final Report, Apr. 1975 - Sep. 1978
R. G. Wilson and R. D. Weglein Dec. 1981 8 p refs
(Contract NBS-5-35898; ARPA Order 2397)
(PB82-165168; NBS-GCR-81-363) Avail: NTIS HC A02/MF A01 CSCL 13H

A scanning acoustic microscope operating at 0.4 GHz and employing water as an immersion fluid was developed for the inspection of semiconductor devices and integrated circuits. This instrument provides a new analysis technique that is sensitive to material properties, namely, the mass density and elastic stiffness. Research with this technique shows that acoustic microscopy will also find useful applications in material research and nondestructive evaluation in general. In particular, the authors discovered a mode of operation that characterizes materials by generating what they call acoustic emission signatures. Changes in the acoustic impedance at interfaces make shallow interfaces observable. With the acoustic microscope, it is possible to display some subsurface features that cannot be seen using optical or scanning electron microscopes. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-32088*# SRI International Corp., Menlo Park, Calif. Molecular Physics Lab.
QUANTITATIVE ABSORPTION AND FLUORESCENCE STUDY OF CO FROM 1060 TO 1550 A
L. C. Lee and J. A. Guest 2 Jun. 1980 15 p refs
(Contract NASw-3270)
(NASA-CR-169292; NAS 1.26:169292) Avail: NTIS HC A02/MF A01 CSCL 20H

Measurement of the photoabsorption cross section of CO in the 1060-1550 A region using synchrotron radiation is described. The oscillator strengths for the transitions from CO (Chi[1] Sigma[+] to various excited states are obtained from these data. Fluorescence from excited CO was observed in the 1150 to 3000 A and 3000 to 8000 A regions. The quantum yields for the production of fluroescence from the Alpha(1)P and B(1)Sigma(+) states are unity because their excitation energies are below the dissociation limit. The C(1)Sigma(+) , v = O level has significant fluorescence quantum yields both in the UV and visible region, but the yields for the E(1)Pi, v = O and C(1)Sigma(+), v = 1 levels are very small. The C(1)Sigma(+), v = 1 level is presumably predissociated. The cross sections for the production of fluroescence from the a'(3)Sigma(+), d(3)Delta sub 1, e(3)Sigma(-) yields a(3)Pi, and B(1)Sigma(+), C(1)Sigma(+) yields A(1)Pi transitions upon excitation from the X(1)Sigma(+) were measured. Author

N82-32089# Science Research Council, Chilton (England). Rutherford and Appleton Labs.
COMPUTER SIMULATION OF THE BLUMLEIN PULSE FORMING NETWORK
C. B. Edwards Mar. 1981 13 p refs
(DE81-700292; RL-81-029) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A computer simulation of the Blumlein pulse-forming network is described. The model is able to treat the case of time varying loads, non-zero conductor resistance, and switch closure effects as exhibited by real systems employing nonohmic loads such as

field emission vacuum diodes in which the impedance is strongly time and voltage dependent. The application of the code to various experimental arrangements is discussed, with particular reference to the prediction of the behavior of the output circuit of 'ELF', on an electron beam generator. The output from the code is compared directly with experimentally obtained voltage waveforms applied to the 'ELF' diode. DOE

N82-32090# California Univ., Livermore. Lawrence Livermore Lab.
TARGET RESPONSE TO HIGH-VELOCITY PENETRATION
M. vanThiel and L. Edwards 16 Oct. 1981 9 p refs Presented at the 6th Intern. Symp. on Ballistics, Orlando, Fla., 27-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003191; UCRL-85904; CONF-811033-2) Avail: NTIS HC A02/MF A01

A simple energy flow model was developed to describe target response to high velocity penetration. Its two basic parts consist of a method for calculating the kinetic energy of the penetrator that is deposited in the target and a formulation of how the resulting energy and momentum are distributed by the initial stress waves. The momentum balance equations for 2D Bernoulli flow and 1D shock or isentropic flow yield closely related results that allow for a simple energy deposition model. The form of the energy flow integral depends on the orientation (geometry) of the rod penetration path with respect to the target surfaces and the direction of the interface momentum. Directional effects in the kinetic terms are accounted for in this model. The model is calibrated and checked by hydro calculations. Comparative calculations with several hydro codes indicate that their results for penetration and hole growth processes agree. Specifically the coupled Eulerian-Lagrange code (CHAMP) selected shows reasonably good agreement with pure Lagrange calculations where these are physically meaningful. DOE

N82-32091# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
SYNTHESIS AND PROPERTIES OF LAYERED SYNTHETIC MICROSTRUCTURE (LSM) DISPERSION ELEMENTS FOR 62 eV (200A) TO 1.24 keV (10A) RADIATION Final Report
T. W. Barbee, Jr. Aug. 1981 52 p refs
(Contract W-7405-eng-48)
(DE82-001671; UCRL-15393) Avail: NTIS HC A04/MF A01

Application of sputter deposition technology to the synthesis of layered synthetic microstructure (LSMs) of sufficient quality for use as X-ray dispersion elements is discussed. High efficiency, controllable bandwidth dispersion elements, with d spacings varying from 15 A to 180 A, may be synthesized onto both mechanically stiff and flexible substrates. Multilayer component materials include tungsten, niobium, molybdenum, titanium, vanadium, and silicon layers separated by carbon layers. Experimental observations of peak reflectivity in first order, integrated reflectivity in first order, and diffraction performance at selected photon energies in the range, 100 to 15,00 eV, are reported and compared to theory. DOE

N82-32092# Hanford Engineering Development Lab., Richland, Wash.
MINIATURE SPECIMEN TENSILE DATA FOR HIGH-ENERGY-NEUTRON-SOURCE EXPERIMENTS
N. F. Panayotou, R. J. Puigh, and E. K. Opperman 30 Sep. 1981 4 p refs Presented at Fusion Reactor Mater. Meeting, Seattle, Wash., 9 Aug. 1981
(Contract DE-AC14-76FF-02170)
(DE82-000981; HEDL-SA-2506-FP; CONF-810831-63) Avail: NTIS HC A02/MF A01

A miniature tensile specimen technology was developed in support of high energy neutron irradiated material testing. The work includes miniature specimen and fabrication technique development, as well as both baseline and irradiated tensile testing. Baseline data obtained using miniature tensile specimens are in good agreement with published values obtained using larger specimen geometries. Tensile data from miniature specimens irradiated up to a high energy, E is approximately 14 MeV, dose level of 10 to the 18th power n/sq cm or 0.003 dpa, were obtained for annealed and cold worked AISI 316 stainless steel. DOE

N82-32093# Cornell Univ., Ithaca, N. Y.
PROTON COLLECTIVE ACCELERATOR STUDIES
J. A. Nation, G. Providakes, and V. Serlin 28 Oct. 1981 10 p refs
(Contract DE-AC02-80ER-10569)
(DE82-007512; DOE/ER-10569/T1) Avail: NTIS HC A02/MF A01

The results of an experimental investigation of nonlinear space charge propagation on a weakly relativistic electron beam is presented. It is shown that nonlinear effects are extremely important, leading to dramatic reductions in the wave phase velocity. Wave phase velocities of 0.06 c were achieved in the nonlinear regime. Some observations made of collective acceleration using localized plasma sources are also described. DOE

N82-32094# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.
MEDIUM-ENERGY NUCLEAR PHYSICS RESEARCH Final Technical Progress Report, 1 May 1971 - 30 Nov. 1981
H. B. Willard 30 Nov. 1981 17 p refs
(Contracts DE-AS02-76ER-02146; EY-S-02-2146)
(DE82-006910; DOE/ER-02146/T1; COO-2146-14) Avail: NTIS HC A02/MF A01

Final results are summarized for this program with the primary emphasis on measurement of ten independent parameters for proton-proton elastic scattering at 300 MeV and four independent such parameters at 650 MeV. Inelastic proton-proton reactions have also been measured at 800 MeV. Proton-deuteron elastic scattering cross sections and polarization analyzing powers have been obtained at 800 MeV. Proton-nucleus total and total Major instrumentation was designed and constructed. DOE

N82-32095# Oak Ridge National Lab., Tenn.
EFFECTS OF FERMI MOTION AND SECONDARY-PARTICLE COLLISIONS FOR PROTON DECAY IN NUCLEI
T. A. Gabriel and M. S. Goodman Feb. 1982 15 p refs
(Contract W-7405-eng-26)
(DE82-0010481; ORNL/TM-8068) Avail: NTIS HC A02/MF A01

The effects of Fermi motion and secondary particle collisions on the pi (0)e(+) produced from proton decay in nuclei are investigated using a Monte Carlo program based on the intranuclear cascade model. The calculations indicate probabilities of 39%, 23%, and 15% for (16)0, (56)Fe, and (207) Pb, respectively, for pi 0 and e(+) to emerge simultaneously with angles 1800 deg + or - 130 deg. These probabilities are insensitive to total energy cuts provided E sub T < or = 0.95 M sub p. DOE

N82-32096# California Univ., Berkeley. Lawrence Berkeley Lab.
COULOMB EFFECTS ON PIONS PRODUCED IN HEAVY-ION REACTIONS
J. P. Sullivan Nov. 1981 212 p refs
(Contract W-7405-eng-48)
(DE82-007198; LBL-12546) Avail: NTIS HC A10/MF A01

Double differential cross sections for the production of (LC OMEGA) () and (LC OMEGA) (+) near the velocity of the incident beam for pion lab angles less than 40 degrees are presented. The experimental apparatus and the techniques are discussed. Beams of (2)ONe with E/A from 80 to 655 MeV and (4) OAr with E/A = 535 MeV incident on Be, C, NaF, KCl, Cu, and U targets were used. A sharp peak in the (LC OMEGA) (+) spectrum and a depression in the (LC OMEGA) () spectrum were observed at zero degrees nears the incident beam velocity. The effect is explained in terms of Coulomb interactions between the pions and fragments of the incident beam. Least squares fits to the data using the Coulomb correction formulas of Gyulassy and Kauffman and an effective projectile fragment charge are made. The relationship between these data and previously measured pion production and projectile fragmentation data is discussed. The

data are also compared to some theoretical models. A simple expression is given for the differential cross section as a function of the projectile mass, target mass, and beam energy. DOE

N82-32097# Wright State Univ., Dayton, Ohio.
DIRECT DETERMINATION OF ATOM AND RADICAL CONCENTRATIONS IN THERMAL REACTIONS OF HYDROCARBONS AND OTHER GASES Progress Report, 1 Jan. - 30 Nov. 1981
G. B. Skinner, Krishna M. Pamidimukkala, and D. R. Wood Dec. 1981 13 p refs
(Contract DE-AS02-76ER-02944)
(DE82-010480; DOE/ER-02944/6) Avail: NTIS HC A02/MF A01

An extensive series of measurements of O concentrations in shock-heated mixtures of C2H6-O2-AR, C2D6-O2-Ar, C3H8-O2-Ar and C3D8-O2-Ar were made. Kinetic modelling calculations were made for these mixtures to correlate these observed O concentrations, and also earlier measurements of H and D atom concentrations in similar mixtures, with elementary reaction rate constants. From these calculations it is expected to deduce rate constants for a number of reactions. Also a series of O atom measurements in H2-N2O-Ar and D2-N2O-Ar mixtures was completed, from which good rate constant data were obtained for the reactions O + H2 yields OH + H and O + D2 yields. DOE

N82-32098# Los Alamos Scientific Lab., N. Mex.
PARTICLE TRANSPORT IN FIELD REVERSED CONFIGURATIONS
M. Tuszewski, R. K. Linford, J. Lipson, and A. G. Sgro 1981 5 p refs Presented at the 4th Symp. on the Phys. and Technol. of Compact Toroids, Livermore, Calif. 27-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002322; LA-UR-81-3153; CONF-811087-9) Avail: NTIS HC A02/MF A01

A field reversed configuration (FRC) is a compact toroid that contains no toroidal field. These plasmas are observed to be grossly stable for about 10 to 100 millisec. The lifetimes appear limited by an n=2 rotational instability which may be caused by particle loss. Particle transport is therefore an important issue for these configurations. The investigation of particle loss with a steady state one dimensional model which approximates the experimental observation of elongated FRC equilibrium with about constant separatrix radius is described. DOE

N82-32099# Los Alamos Scientific Lab., N. Mex.
LEPTON STABILITY
Martin C. Cooper 1981 17 p refs Presented at the Meeting of the Div. of Particles and Fields of the Am. Phys. Soc., Santa Cruz, Calif., 9 Sep. 1981
(Contract W-7405-eng-36)
(DE82-002392; LA-UR-81-2921; CONF-810986-2) Avail: NTIS HC A02/MF A01

The problem of flavor-changing currents in the Lepton sector is reviewed. The emphasis is on the experimental situation, with a brief discussion of the theoretical problems which are addressed by the measurements. DOE

N82-32100# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
GLUEBALL AND EXOTIC-MESON CANDIDATES
Michael S. Chanowitz Sep. 1981 14 p refs Presented at the Meeting of the Div. of Particles and Fields of the Am. Phys. Soc., Santa Cruz, Calif., 9-11 Sep. 1981
(Contract W-7405-eng-48)
(DE82-002948; LBL-13398; CONF-810986-4) Avail: NTIS HC A02/MF A01

The states seen in radiative psi decay at 1440 and 1640 MeV are discussed. The former is almost certainly a glueball while the latter is probably either a glueball or a four quark anti ss(anti uu + anti dd) state. The present status and verification of these assignments is discussed. DOE

N82-32101# Melbourne Univ., Parkville (Australia). School of Physics.
NEUTRINO OSCILLATION AND RARE MUON DECAYS IN THE PRESENCE OF A HEAVY NEUTRINO
Bruce H. J. McKellar 1980 8 p refs
(UM-P-80/31) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Heavy neutrinos are recognized as providing a possible mechanism for muon number violating processes. Rates for these processes depend on neutrino mixing angles and masses. If the heavy neutrino mass is less than 400 MeV, it is shown that the present limit on muon neutrino - electron neutrino oscillations provides very stringent limits on the contribution of these processes to the rates for muon number violating processes. DOE

N82-32102# Melbourne Univ., Parkville (Australia). School of Physics.
PHENOMENOLOGICAL NUCLEON-NUCLEON INTERACTION
L. Petris 1980 19 p refs
(UM-P-80/34) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A phenomenological NN interaction which fits the deuteron properties and the elastic scattering data, is presented. The only parameters are the pion, rho and omega masses and one overall strength. DOE

N82-32103# Melbourne Univ., Parkville (Australia). Theoretical Physics Group.
THE INFLUENCE OF MIXING OF FINITE MASS NEUTRINOS ON BETA DECAY SPECTRA
B. H. J. McKellar 1980 8 p refs
(UM-P-80/50) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Neutrino mixing, of the type required for neutrino oscillations, complicates efforts to determine the electron neutrino mass from the beta decay spectra. The shape of the spectra depends on the masses and mixing angles of all neutrinos which couple to the electron neutrino. DOE

N82-32104# Melbourne Univ., Parkville (Australia). Theoretical Physics Group.
NEUTRINO OSCILLATIONS AND ANTI NU SUB (E)-E SCATTERING
Bronwyn Halls and Bruce H. J. McKellar 1980 10 p refs
(UM-P-80/53) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Electron antineutrino-electron scattering is modified in the presence of neutrino mixing and neutrino oscillation. In the Weinberg-Salam model the results for reactor antineutrinos are insensitive to the degree of mixing, to the extent that the experiment of Reines, Gurr and Sobel cannot differentiate between no oscillation and complete disappearance of the electron antineutrinos from the beam. DOE

N82-32105# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ELASTIC SCATTERING AND CHARGE-EXCHANGE OF PIONS BY 3He AT THE INTERMEDIATE ENERGIES
V. B. Belyaev, S. A. Rakityanskii, and J. Wrzecionko 1980 13 p refs
(JINR-E-2-80-219) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

An attempt is made to describe the experimental data on elastic interaction of pi(+-) mesons with light nuclei in the energy region 68 to 208 MeV. As the theoretical basis, the approximate four particle equations modified in the spirit of the impulse approximations are used. The agreement with the data in the forward hemisphere for all energies is achieved. For the backward scattering, the agreement exists only at 68 MeV and 208 MeV pion energy. DOE

N82-32106# Joint Inst. for Nuclear Research, Dubna (USSR).
APPLICATION OF THE APPROXIMATE FOUR BODY EQUATIONS TO DESCRIPTION OF THE ELASTIC SCATTERING AND CHARGE EXCHANGE OF PIONS BY He3 NUCLEUS

V. B. Belyaev, M. G. Sapozhnicov, and J. Wrzecionko (Warsaw Inst. for Nuclear Research) 1980 12 p refs Submitted for publication
(JINR-E-4-13030) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

In the framework of the approximate four body equations the elastic scattering and charge exchange of pions on He-3 nucleus in the 68 to 208 MeV pion energy range is investigated. These equations differ from the description within the optical model with the first order optical potential in two aspects. The equations are derived without the impuse approximation. The rescattering of pions on nucleus is taken into account in all orders. Basic equations are derived. The strong dependence of the obtained cross sections of elastic scattering on the form of parametrization of the elementary pi N interaction indicates the necessity of a more thorough study of pi nuclear cross sections as functions of the off mass shell behavior of elementary pi N amplitudes. The energy dependence of the charge exchange cross section at the fixed scattering angle 115 deg displays a more sharp decrease with increasing than that observed experimentally. DOE

N82-32107# Melbourne Univ., Parkville (Australia). School of Physics.
PHOTONEUTRON CROSS SECTION OF Si-29
R. E. Pywell, B. L. Berman (California Univ., Lawrence Livermore Lab.), P. Kean, and M. N. Thompson 1981 15 p refs
(UM-P-80/68) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The photoneutron cross section of Si-29 has been measured over the energy range 8 to 28 MeV using the bremsstrahlung yield curve technique. The giant dipole resonance is observed to be centered at 21.2 MeV and is 5.5 MeV wide. In addition, a pygmy resonance containing much fine structure is observed below 17 MeV. An attempt is made to interpret these observations in terms of the weak coupling of the extra neutron to a Si-28 core. However, detailed comparisons of the structure and relative strengths of the Si-28 and Si-29 cross sections reveal that the coupling of the extra-core nucleon is large and significantly modifies the core wave function. DOE

N82-32108# Los Alamos Scientific Lab., N. Mex.
SYSTEMATICS OF RADII AND NUCLEAR CHARGE DISTRIBUTIONS INDUCED FROM ELASTIC ELECTRON SCATTERING, MUONIC X-RAY, AND OPTICAL ISOTOPE-SHIFT MEASUREMENTS
H. J. Emrich, G. Fricke, M. Hoehn, K. Kaser, H. Miska, B. Robert-Tissot, D. Rychel, L. Schaller, L. Schellenberg, H. Scheuwly et al 1981 9 p refs Presented at the 4th Intern. Conf. on Nuclei Far from Stability, Helsingor, Denmark, 7-13 Jun. 1981
(Contract W-7405-eng-36)
(DE82-000757; LA-UR-81-2867; CONF-810649-16) Avail: NTIS HC A02/MF A01

The nuclear charge distribution and nuclear charge distribution differences have been investigated by 350 MeV elastic electron scattering at the Institut fuer Kernphysik, Universitaet Mainz. Muonic X-ray measurements yield complementary information to electron scattering results. Both experimental data are analyzed in an almost model independent way. Muonic X-ray measurements were performed for the region 40 C a up to 100 Mo. Muonic X-ray transition energies allow the determination of one radial parameter R/sub k/ - the Barrett radius - with high precision. This Barrett radius combined with the charge distribution from elastic electron scattering yields precise radial parameters. With the abolute values of these radial moments, it is possible to determine the two optical constants: the electron density at the nucleus and the specific mass shift. DOE

N82-32109# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
GRASSMANN ANALYTICITY AND EXTENDED SUPERSYMMETRIES
A. S. Galperin, E. A. Ivanov, and V. I. Ogievetsky 1980 8 p refs Submitted for publication
(JINR-E-2-80-750) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A notion of Grassmann analyticity is introduced and it is shown how it helps to reduce the number of Majorana spinor variables. It is also shown that already in the N = 1 supersymmetry the chirality can be also interpreted as the analyticity. A complex superfield that satisfies the Cauchy-Riemann condition is shown to be analytic. It has been checked up that the hypercomplex coordinates form invariant spaces of the N = 4 supersymmetry and of N = 8 supersymmetry. DOE

N82-32110# Melbourne Univ., Parkville (Australia). School of Physics.
OSCILLATIONS OF MASSLESS NEUTRINOS AS A REFRACTIVE PHENOMENA
Geoffrey I. Opat 1980 9 p refs
(UM-P-80/38) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A phenomenology of neutrino oscillations is presented, based on the assumption that massless neutrinos are refracted in ordinary matter by an interaction, important at low energy, which causes transitions between neutrinos of differing kind. The predictions are experimentally distinguishable from those based on the vacuum oscillations of massive neutrinos. DOE

N82-32111# Melbourne Univ., Parkville (Australia). School of Physics.
OSCILLATION AND MIXING OF MASSLESS ELECTRON AND MUON NEUTRINOS
Bruce H. J. McKellar 1980 6 p refs
(UM-P-80/30) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

It is not necessary that the electron neutrino and muon neutrino themselves have mass for oscillations to occur. For N neutrinos, if one is massive, oscillations occur with unique oscillation length determined by the mass of the heavy neutrino, mimicking two-neutrino mixing. Any observation of oscillations cannot therefore be regarded as evidence for a finite mass electron neutrino or muon neutrino. DOE

N82-32112# California Univ., Berkeley. Lawrence Berkeley Lab.
TOPOLOGICAL BOOTSTRAP
G. F. Chew Oct. 1981 42 p refs Presented at the MIT Symp., Cambridge, Mass., 15 Oct. 1981
(Contract W-7405-eng-48)
(DE82-010342; LBL-13276; CONF-8110155-1) Avail: NTIS HC A03/MF A01

An approach to the bootstrap idea in which local space-time is not a conceptual starting ingredient is described. The starting idea is a notion of elementary event, with a past and a future but not embedded in a continuous space time. Topics covered include entropy and the topological expansion, spin and electric charge, the quantum surface, topological supersymmetry, electroweak interactions, space-time, and accessible and inaccessible degrees of freedom. DOE

N82-32113# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MOLECULAR BEAM STUDIES OF BIMOLECULAR REACTIONS: F + H2 AND LI + HF
Y. T. Lee Oct. 1981 36 p refs Presented at the Conf. on 50 Years Dyn. of Chem. Reactions, West Berlin, 12-15 Oct. 1981
(Contract W-7405-eng-48)
(DE82-005677; LBL-13712; CONF-8110153-1) Avail: NTIS HC A03/MF A01

Using reactions of F + H2 yields HF + H and Li + HF yields LiF + H as examples, the application of the crossed molecular beams method in the investigation of dynamics of bimolecular chemical reactions is described. The angular distributions of reaction products and their implication to the relation between potential energy surface and reaction dynamics is emphasized. DOE

N82-32114# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.
ELECTRON STRUCTURE OF MOLECULES WITH VERY HEAVY ATOMS USING EFFECTIVE CORE POTENTIALS
Kenneth S. Pitzer Jan. 1982 20 p refs Presented at the NATO Advan. Study Inst. on Relativistic Effects in Atoms, Vancouver, Canada
(Contract W-7405-eng-48)
(DE82-010169; LBL-13266; CONF-8108115-1) Avail: NTIS HC A02/MF A01

The general method for the removal of inner shell electrons from the detailed calculations is a frozen core, effective potential approximation. Pertinent theory related to such an approximation is considered on both nonrelativistic and relativistic bases. But the eventual verification is comparison with accurate all electron calculations. Such comparisons are made for nonrelativistic examples. All electron, relativistic calculations on appropriate molecules with very heavy atoms are needed as standards of comparison. DOE

N82-32115# Oregon Univ., Eugene. Inst. of Theoretical Science.
THEORY OF ELEMENTARY PARTICLES Annual Report
18 Dec. 1981 10 p refs
(Contract DE-AT-6-76ER-70004)
(DE82-008463; DOE/ER-70004/322) Avail: NTIS HC A02/MF A01

Soft hadronic processes, tests of quantum chromodynamics, weak interactions, optimal formalism for polarization analysis, large order behavior of perturbation theory, and X-ray physics arising from electron storage rings were studied. The structure of the eta' meson in quantum chromodynamics, CP nonconservation through Higgs-Exchange, flavor changing electromagnetic process, and the electric dipole moment of the neutron are also investigated. DOE

N82-32116# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
PROCEEDINGS OF THE JOHN HOPKINS WORKSHOP ON CURRENT PROBLEMS IN PARTICLE THEORY. 5: UNIFIED FIELD THEORIES AND BEYOND
1981 68 p refs Workshop held at Baltimore, Md., 25 May 1981
(Contract DE-AS02-76ER-03285)
(DE82-007210; DOE/ER-03285/39; CONF-8105141) Avail: NTIS HC A04/MF A01

Unified field theories in particle theory are reviewed. Topics covered include: symmetric gauge theories; infinite lie algebras in physics; the mechanism for confinement in massive quark QCD; a search for possible composite models of quarks and leptons; the radiative structure of fermion masses; fractional electric charge in QCD; heavy particle effects; fermion mass hierarchies in theories of technicolor; satistical notions applied in the early universe; grand unification and cosmology, an environmental impact statement; first order phase transition in the early universe; the electric dipole moment of the neutron; cosmological constraints on grand unified theories; and the consequences for CP invariance of instanton angles THETA in dynamically broken gauge theories. DOE

N82-32117# Johns Hopkins Univ., Baltimore, Md. Dept. of Chemistry.
STUDIES IN HOT-ATOM AND RADIATION CHEMISTRY Final Report, 1 Dec. 1968 - 31 Nov. 1981
W. S. Koski Jan. 1982 19 p refs
(Contract DE-AS02-76ER-03283)
(DE82-010792; DOE/ER-03283/36) Avail: NTIS HC A02/MF A01

Ion beam techniques applied to potential ionic processes that take place in hot atom and radiation chemical processes were investigated. A number of three atom ion molecule reactions were studied. The presence of various electronic states in the final product was demonstrated by energy techniques. The vibrational structure in the CH( ) product was measured. It was also demonstrated that measurements of the minimum value of the translational exoergicity (Q/sub min/) can be used to determine the electronic states of the final diatomic product. It is also shown that Q/sub min/ also reflects the rotatinal energy content of the diatomic ionic product. Ion beam techniques were applied to hot atom processes particularly involving bromine. It is found that in the collisions of halogen positive ions with rare gas atoms there is an efficient mechanism for transferring electronic energy of excitation from the halogen ion to translational energy of the rare gas atom and vice versa. DOE

N82-32118# Oak Ridge National Lab., Tenn.
UNIVERSAL MODE WITH DIFFUSIVE ELECTRONS: LINEAR INSTABILITY AND NONLINEAR SATURATION
C. O. Beasley, Jr., K. Molving (MIT), and W. vanRij Mar. 1982 32 p refs
(Contract W-7405-eng-26)
(DE82-008903; ORNL/TM-8132) Avail: NTIS HC A03/MF A01

The effect of spatial electron diffusion on the stability properties of the universal drift mode in a sheared magnetic field are studied using an initial value code, TEDIT. The diffusion operator is treated precisely and the treatment of a realistic parallel velocity dependence of the diffusion coefficient is allowed. For the case of a velocity independent diffusion coefficient, the qualitative features are observed. The modes with k sub y rho sub i $>$ 1 destabilize at small values of the diffusion coefficient and saturate at higher values, corresponding to several orders of magnitude in D. There are quantitative discrepancies, near the saturation point, can be accounted for reasonably well by a simple asymptotic theory. DOE

N82-32119# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.
A NEW APPROACH TO THE CALCULATION OF GROUND STATE PROPERTIES OF FEW-BODY SYSTEMS Ph.D. Thesis [UN NUOVO METODO PER LA RISOLUZIONE DEL PROBLEMA DI POCHI NUCLEONI INTERAGENTI TRAMITE POTENZIALI REALISTICI]
S. Simula 24 Mar. 1981 26 p refs In ITALIAN; ENGLISH summary Submitted for publication
(ISS-P-81/2; ISSN-0390-6469) Avail: NTIS HC A03/MF A01

A variational approach of the calculation of the ground state of few interacting nucleons is presented. The method is based on a variational wave function obtained by expansion of a correlated harmonic oscillator. Calculations for two nucleons show that the maximum number of harmonic oscillator quanta which have to be included in the expansion is much less than the corresponding number resulting from the expansion in a pure harmonic oscillator. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N82-32120# International Energy Systems Corp., San Jose, Calif.
ALTERNATIVE NUCLEAR TECHNOLOGIES Final Report
E. Schubert Oct. 1981 118 p refs Sponsored by Electric Power Research Inst.
(Contract EPRI-TPS-78-817)
(DE82-900974; EPRI-P-2073) Avail: NTIS HC A06/MF A01

The lead times required to develop a select group of nuclear fission reactor types and fuel cycles to the point of readiness for full commercialization are compared. Along with lead times, fuel material requirements and comparative costs of producing electric power were estimated. A conservative approach and consistent criteria for all systems were used in estimates of the steps required and the times involved in developing each technology. The impact of the inevitable exhaustion of the low- or reasonable-cost uranium reserves in the United States on the desirability of completing the

breeder reactor program, with its favorable long-term result on fission fuel supplies, is discussed. The long times projected to bring the most advanced alternative converter reactor technologies the heavy water reactor and the high-temperature gas-cooled reactor into commercial deployment when compared to the time projected to bring the breeder reactor into equivalent status suggest that the country's best choice is to develop the breeder. The perceived diversion-proliferation problems with the uranium plutonium fuel cycle have workable solutions that can be developed which will enable the use of those materials at substantially reduced levels of diversion risk. DOE

N82-32121# Department of Energy, Washington, D. C. Office of Nuclear Waste Management and Fuel Cycle Programs.
MONITORED RETRIEVABLE STORAGE CONCEPT: A REVIEW OF ITS STATUS AND ANALYSIS OF ITS IMPACT ON THE WASTE MANAGEMENT SYSTEM
[1982] 147 p refs
(DE82-003544; DOE/NE-0019) Avail: NTIS HC A07/MF A01

The concept of monitored retrievable storage (MRS) for commercial spent fuel elements and high-level waste is based on using a high-integrity canister and a structure of some type to protect the canister from natural or man-caused events. Cooling is by means of a passive method. Seven concepts are described (dry well, casks, tunnel). The feasibility of demonstration MRS facilities is studied in this report. Two prospective sites are considered at Hanford and Nevada Test Site, and capital cost estimates were made. DOE

N82-32122# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
APPLICATION OF THE IRON-ENRICHED BASALT WASTE FORM FOR IMMOBILIZING COMMERCIAL TRANSURANIC WASTE
D. E. Owen Aug. 1981 35 p refs
(Contract DE-AC07-76ID-01570)
(DE82-002720; EGG-WM-5484) Avail: NTIS HC A03/MF A01

The principal sources of commercial transuranic (TRU) waste in the United States are identified. The physical and chemical nature of the wastes from these sources are discussed. The fabrication technique and properties of iron enriched basalt, a rock-like waste from developed for immobilizing defense TRU wastes, are discussed. The application of iron enriched basalt to commercial TRU wastes is discussed. Commercial TRU wastes from mixed oxide fuel fabrication, light water reactor fuel reprocessing, and miscellaneous medical, research, and industrial sources are reviewed. These indicate that iron enriched basalt is suitable for most types of commercial TRU wastes. Noncombustible TRU wastes are dissolved in the high temperature, oxidizing iron enriched basalt melt. Combustible TRU wastes are immobilized in iron enriched basalt by incinerating the wastes and adding the TRU bearing ash to the melt. Casting and controlled cooling of the melt produces a devitrified, rock like iron enriched basalt monolith. DOE

N82-32123# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
RESEARCH IN THEORETICAL NUCLEAR PHYSICS Progress Report
Benjamin F. Bayman 1982 33 p refs
(Contract DE-AS02-79ER-10364)
(DE82-007952; DOE/ER-10364/31) Avail: NTIS HC A03/MF A01

Research progress on the following subjects is summarized: (1) first and second order contributions to two-neutron transfer, (2) proximity potential in coupled-channel calculations, (3) spin-depended interactions in heavy ion reactions, (4) nuclear field theory and standard Goldstone perturbation theory, (5) effective operators with potential from meson theory, (6) microscopic study of the (3) He alpha, gamma (7) Be electric-dipole capture reaction, and (7) influence of target clustering on internuclear antisymmetrization. Project proposals are reviewed and publications are listed. DOE

N82-32124# Oak Ridge National Lab., Tenn.
STUDY OF DROPLET FORMATION FOR PREPARATION OF SPHERES BY INTERNAL GELATION
C. R. Chu and J. C. Card Jan. 1982 53 p refs
(Contract W-7405-eng-36)
(DE82-007500; ORNL/MIT-337) Avail: NTIS HC A04/MF A01

The internal-gelation process can be used to permanently immobilize highly radioactive nuclear wastes. A study was conducted to determine the factors affecting the formation of stable, uniform droplets from a vibrating nozzle, which is a critical step in this process. Experimental data were collected using four nozzle diameters (325 to 586 (SIGMA)m) with jet velocities ranging from 1 to 10 m/s, and three test liquids, whose physical properties cover the possible range of the waste fluid. A dimensional analysis identified the pertinent dimensionless groups as Reynolds, Weber, Froude, and Power numbers, and a dimensionless droplet spacing. Power-function correlations of the data in these dimensionless groups are presented, which define the region of good droplet formation. A unique catcher-stream design is also presented, which improves performance of the process at higher flow rates and frequencies. DOE

N82-32125# Department of Energy, Washington, D. C. Div. of High Energy Physics.
INTERIM REPORT OF THE SUBPANEL ON LONG RANGE PLANNING FOR THE US HIGH ENERGY PHYSICS PROGRAM OF THE HIGH ENERGY PHYSICS ADVISORY PANEL
Nov. 1981 31 p
(DE82-004032; DOE/ER-0112) Avail: NTIS HC A03/MF A01

The subpanel strongly recommends that the ISABELLE project go forward and be completed during this decade. ISABELLE provides a major new facility that will enable the U.S. high energy physics program to remain active and healthy during this decade and into the next. The construction of ISABELLE and the other essential components of the US program require a minimum annual level of support that averages $440M (FY 1982 dollars) in DOE funds per year. If support at this level cannot be made available in time for ISABELLE completion within this decade, the ISABELLE project cannot be continued. DOE

N82-32126# Los Alamos Scientific Lab., N. Mex.
POWER REDUCTION BY CHANGING THE DESIGN PARTICLE PHASE
G. R. Swain 1981 4 p refs Presented at the 1981 Linear Accelerator Conf., Santa Fe, N. Mex., 20 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002374; LA-UR-81-3076; CONF-811083-8) Avail: NTIS HC A02/MF A01

The side coupled linac at the Clinton P. Anderson Meson Physics Facility (LAMPF) at Los Alamos operates at a design phase of -30 degrees, except for the first few modules, which have design phases tapering from -36 to -30 degrees in order to increase the acceptance. (Design phase for this stepped beta structure is equivalent to synchronous phase. The RF amplitude is proportional in the secant of the design phase, and thus a module operated at -36 degrees has a higher amplitude than one operated at -30 degrees. Calculations with the GROPE and SIMALAC codes indicate that the longitudinal and transverse beam characteristics would be little affected if the design phase of the downstream end of the linac was gradually ramped to -20 or -15 degrees, thus lowering the RF amplitude for this part of the linac. Experimental tests of this mode of operation are described and the expected power savings are discussed. DOE

N82-32127# Los Alamos Scientific Lab., N. Mex.
EXPERIMENTAL RFQ AS INJECTOR TO THE CERN LINAC 1
E. Boltezar, H. Haseroth, G. Plass, W. Pirkl, M. Weiss, K. R. Crandall, R. W. Hamm, J. M. Potter, R. H. Stokes, J. E. Stovell et al 1981 4 p refs Presented at the Linear Accelerator Conf., Santa Fe, N. Mex., 15-21 Oct. 1981
(DE82-002332; LA-UR-81-3172; CONF-811083-3) Avail: NTIS HC A02/MF A01

A 202.56 MHz RFQ for Linac I (Old Linac) is being built. The

RFQ is based on proven design approach, but will have to meet requirements of the existing environment. The design characteristics of this accelerator are described, and some conclusions based on model work are given. DOE

N82-32128# Los Alamos Scientific Lab., N. Mex.
TUNING EXPERIENCE WITH THE FMIT SCALE-MODEL DRIFT-TUBE LINAC
L. M. Earley, J. M. Potter, and A. J. Thomas Oct. 1981 4 p refs Presented at Linear Accelerator Conf., Santa Fe, N. Mex., 19 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002359; LA-UR-81-3060; CONF-811083-5) Avail: NTIS HC A02/MF A01

A scale model of the fusion materials irradiation test facility (FMIT) 80 MHz drift tube linac (DTL) was constructed to investigate the tuning procedure. The model DTL has 16 cells and was constructed to have the accelerating mode at 367 MHz. The mode spectrum was measured for various post-penetrations, and field profiles of the modes were recorded. The field profiles were measured by using a beadpull apparatus, together with an automatic data acquisition system. Tilt sensitivity measurements were performed to find the optimum post-penetrations for stabilizing the accelerating mode. DOE

N82-32129# Los Alamos Scientific Lab., N. Mex. Accelerator Technology Div.
PIGMI LINEAR-ACCELERATOR TECHNOLOGY
T. J. Boyd, K. R. Crandall, R. W. Hamm, L. D. Hansborough, R. F. Hoeberling, R. A. Jameson, E. A. Knapp, D. W. Mueller, J. M. Potter, R. H. Stokes et al 1981 19 p refs Presented at the Intern. Workshop on Pion and Heavy Ion Radiotherapy: Preclinical and Clinical Studies, Vancover (Canada), 29-31 Jul. 1981
(Contract W-7405-eng-36)
(DE82-000577; LA-UR-81-2717) Avail: NTIS HC A02/MF A01

A linear accelerator technology was developed that makes pi-meson (pion) generation possible for cancer therapy in the setting of a major hospital center. This technology uses several major inventions in particle accelerator science such as an accelerator system called the radio frequency quadrupole FQ), and permanent magnet drift tube focusing to substantially reduce the size, cost, and complexity of a meson factory for this use. This paper describes this technology, and other possible uses for these developments, and costs for such installations are discussed.DOE

N82-32130# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazoni.
STATISTICAL ANALYSIS OF EXPERIMENTAL DATA GATHERED AT ADONE [ANALISI STATISTICA DEI DATI SPERIMENTALI RACCOLTI AT ADONE]
C. Stanescu 2 Jul. 1981 38 p refs In ITALIAN; ENGLISH summary
(ISS-R-81/8; ISSN-0390-6477) Avail: NTIS HC A03/MF A01

The statistical analysis of high energy physics experiments carried out with ADONE is described. The experiment determined the energy dependance of the hadrons formed after a position-electron collision. The internal consistency of the available data was examined and the existence of a fine structure was investigated using the whole set data. A high significance level is found for the 1.5 GeV experimental data, but further specific experiments do not confirm the existence of such a fine structure.
Author (ESA)

N82-32131# Technische Hogeschool, Delft (Netherlands). Lab. for Thermal Power Engineering.
POST-SCRAM LIQUID METAL COOLED FAST BREEDER REACTOR (LMFBR) NEAT TRANSPORT SYSTEM DYNAMICS AND STEAM GENERATOR CONTROL
J. F. L. M. Brukx Jun. 1982 171 p refs 2 Vol.
(WTHD-146-Vol-1) Avail: NTIS HC A08/MF A01

Loop type LMFBR heat transport system dynamics after reactor shutdown and during subsequent decay heat removal are considered with emphasis on steam generator dynamics including the development and evaluation of various post-scram steam generator control systems, and natural circulation of the sodium coolant, including the influence of superimposed free convection on forced convection heat transfer and pressure drop. The normal operating and decay heat removal functions of the overall heat transport system are described. S.L.

N82-32132# Technische Hogeschool, Delft (Netherlands). Lab. for Thermal Power Engineering.
POST-SCRAM LIQUID METAL COOLED FAST BREEDER REACTOR (LMFBR) HEAT TRANSPORT SYSTEM DYNAMICS AND STEAM GENERATOR CONTROL: FIGURES
J. F. L. M. Brukx Jun. 1982 139 p 2 Vol.
(WTHD-146-Vol-2) Avail: NTIS HC A07/MF A01

Dynamic modeling of LMFBR heat transport system is discussed. Uncontrolled transient behavior of individual components and of the integrated heat transport system are considered. For each component, results showing specific dynamic features of the component and/or model capability were generated. Controlled dynamic behavior for alternative steam generator control systems during forced and natural sodium coolant circulation was analyzed. Combined free and forced convection of laminar and turbulent vertical pipe flow of liquid metals was investigated. Author (ESA)

74 OPTICS

Includes light phenomena.

N82-32133*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
STRESS INDUCED LONG WAVELENGTH PHOTOCONDUCTIVITY IN DOPED SILICON INFRARED DETECTORS Final Technical Report, 1 Nov. 1980 - 28 Feb. 1982
J. R. Houck Aug. 1982 8 p refs
(Grant NAG2-70)
(NASA-CR-169277; NAS 1.26:169277) Avail: NTIS HC A02/MF A01 CSCL 20F

The long wavelength cutoff of a Si:P detector was extended to 34 microns by the application of a uniaxial stress. An unstressed Si:P photoconductive detector responds to photons of up to 28 microns wavelength. By applying a uniaxial stress to a detector along the /100/ crystal axis, the response was extended to approximately 34 microns. The /100/ axis was chosen as the stress direction because theoretical calculations predicted that such a stress extends the wavelength response more than one along the /110/ axis. These theoretical calculations were based upon fits to experimental data obtained at stresses of up to approximately kbar, and indicated that the extension in wavelength response continues to increase at much larger stresses. S.L.

N82-32134# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INFRARED RADIOMETRY [RADIOMETRIA NO INFRAVERMELHO]
Amauri S. Montes and C. C. Ghizoni Feb. 1982 13 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC
(INPE-2323-PRE/079) Avail: NTIS HC A02/MF A01

The observation of infrared radiation from the Earth to space is important in the study of meteorology and climatology. A high resolution radiometer was projected and constructed for this purpose. The spectral range was from the wavelength of 1.8 microns to 22 microns, including the 'atmospheric window' (8 to 14 microns and various bands of absorbers like water vapor, carbon dioxide and ozone. The instrument was used in a balloon and measurements were made during eight hours at an altitude of 35 km. S.L.

N82-32135# Technology Associates, Inc., West Lafayette, Ind.
FABRICATION AND EXPERIMENTAL TECHNIQUES IN INTEGRATED OPTICS Final Report, Feb. - Sep. 1981
Chin-Lin Chen Sep. 1981 53 p refs

(Contract N00163-81-M-1798)
(AD-A115204; NAC-TR-2318) Avail: NTIS HC A04/MF A01 CSCL 20/6

A program to investigate the characteristics of integrated optical components, coupling between optical waveguides and other optical components and waveguide fabrication technology was initiated in February 20, 1981 for Naval Avionics Center under contract N00163 81 M 1798. The work performed under this contract is summarized in this report. The Navy technical monitor was Dr. K. J. Jones. A coupling measurement system was modified and improved. Numerical techniques for computing the refractive index and the thickness of the optical films from the experimental data are discussed. Techniques based on optical fibers and TV cameras for measuring the waveguide attenuation, and techniques related to end-fire coupling and near infrared radiation are considered. Methods for fabricating solution-deposited waveguides and waveguides on glass, lithium niobate and lithium tantalate substrates are also reviewed. Author (GRA)

N82-32136# Probe Systems, Inc., Sunnyvale, Calif.
OPTICAL EXCISION PROGRAM OPTICAL EXCISOR FIELD TESTS
Dave Jackson Feb. 1982 54 p refs
(Contract N00039-79-C-0141; ARPA Order 3621)
(AD-A115367; PSI-ER-5538-04) Avail: NTIS HC A04/MF A01 CSCL 09/5

A brassboard optical excisor was tested in a real-world spread spectrum intercept system with both actual and simulated signals. It was shown that the vulnerability of the spread spectrum intercept system to narrowband jammer interference was significantly reduced by the frequency selective rejection capabilities of the optical excisor. The brassboard optical excisor was assembled on a 2 x 4 foot table and had 40 megahertz of coherent bandwidth with approximately 200 resolvable frequencies. This brassboard was tested inside a van which contains 3 full racks of equipment devoted to spread spectrum intercept. Test data for a spread spectrum chip detector with and without an optical excisor were collected. This data utilized a simulated spread spectrum signal having a 10 megahertz chip rate and a negative signal-to-noise ratio combined with a simulated narrowband jammer. With optical excision, the chip detector demonstrated a 25 db improvement in narrowband jammer noise immunity with essentially no degradation in chip detector sensitivity when compared to the chip detector without optical excision. These tests also demonstrated the optical excisor's ability to coherently process broadband signals while achieving a frequency stability better than 3.3 hertz. GRA

N82-32137# Probe Systems, Inc., Sunnyvale, Calif.
OPTICAL EXCISION PROGRAM Final Report
Jerry Erickson and Dave Jackson Feb. 1982 67 p refs
(Contract N00039-79-C-0141; ARPA Order 3621)
(AD-A115368; PSI-ER-5538-05) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report summarizes the results obtained by PROBE SYSTEMS as part of a joint DARPA/NAVELEX program for investigation of optical excision. As originally conceived, optical excision is an acousto-optic technique for adaptively rejecting narrowband interference from broadband signals. This adaptive rejection of narrowband interference is an important means of reducing the vulnerability of spread spectrum systems to narrowband jamming. Broadband tests were performed to compare architectures and evaluate components. GRA

N82-32138# Aerodyne Research, Inc., Bedford, Mass.
MM&T: BIBLIOGRAPHY ON OPTICAL TESTING WITH APPENDIX
Alejandro Cornejo-Rodriguez (INAOE, Puebla, Mexico), H. J. Caulfield (Aerodyne Research, Inc., Bedford, Mass.), and William Friday 26 Feb. 1982 321 p
(Contract DAAK40-79-C-0275)
(AD-A116282; AD-E950249; DRSMI/RH-CR-82-6) Avail: NTIS HC A14/MF A01 CSCL 20/6

The following is a major expansion of 'Bibliography on Various Optical Testing Methods,' by Daniel Malacara, Alejandro Cornejo, and M. V. R. K. Murty which appeared in Applied Optica, 14, 1065 - 1080(1975). It is computerized to allow for easy update and correction. The last update was in September 1979. For availability information, please contact either of the authors. The present bibliography occupies 321 pages and includes the work of Cornejo, et al. as an appendix. GRA

N82-32139# Army Military Personnel Center, Alexandria, Va.
INTERSYMBOL INTERFERENCE IN A GRADED-INDEX FIBER OPTIC COMMUNICATION SYSTEM M.S. Thesis. Final Report
Raymond Louis Wachtel Apr. 1982 56 p refs
(AD-A116277) Avail: NTIS HC A04/MF A01 CSCL 20/6

In this report, the effects of pulse dispersion and noise in a graded-index are examined. It is shown that pulse dispersion can result in intersymbol interference and degraded error performance of the system. Expressions for RMS output pulse width, intersymbol interference, optimum threshold receiver level, and error probabilities are developed in terms of system parameters. GRA

N82-32140# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
FIBER OPTICS REMOTING OF TERMINAL RADAR AND BEACON SIGNALS Final Report, Jul. 1980 - May 1981
Robert G. Oliver May 1982 68 p refs
(FAA Proj. 021-241-860)
(AD-A116403; FAA-CT-81-71; FAA-RD-82-20) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report discusses the study phase of the terminal radar-beacon fiber optics remoting project. Fiber optics technology is discussed and applied to the remoting of airport sureveillance radar (ASR) and air traffic control beacon interrogator (ATCBI) video and control signals. The requirements of this system are outlined and an engineering model, using multiplexed and nonmultiplexed video transmissions, is specified for installation at the Federal Aviation Administration (FAA) Technical Center. Tests to be conducted on this system are briefly outlined. Cost estimates are presented as well as suggested sources of supply fort the fiber optic components. The interface to the ASR and ATCBI systems is described. It is recommended that the system be built by the technical center. A schedule for completion of the remainder of the project is presented. Author (GRA)

N82-32141# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
SEEKER TARGET SYSTEM INVESTIGATION Final Technical Report, 8 Jul. 1980 - 7 Oct. 1981
Gene R. Loefer and David E. Schmieder Griffiss AFB, N.Y. RADC Apr. 1982 34 p
(Contract F30602-80-C-0233; AF Proj. 2064)
(AD-A116572; GIT/EES-A-2692; RADC-TR-82-71) Avail: NTIS HC A03/MF A01 CSCL 17/8

The design and construction of a target source simulation breadboard is discussed. The seeker target system (STS) is designed to be used to test infrared, laser, and electro-optical guided missiles in the Rome Air Development Center (RADC) anechoic test chamber. In this test, a missile will be subjected to RF radiation to determine its electromagnetic interference (EMI) susceptibility. In particular, the tests will attempt to determine the conditions which cause loss of missile control as a function of target parameters. In these tests, the simulator will provide a target upon which to lock the missile seeker and control gimbal pointing angle and track rate. The objective of this effort is to validate the design concept through the construction of a breadboard system. A primary goal of the breadboard design was to produce a system that would be as close to a fully operational simulator as possible. This goal has in fact been accomplished, with the final design meeting or exceeding nearly all critical design goals. GRA

N82-32142# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TRANSVERSE EFFECTS IN OPTICAL BISTABILITY AND SUPERFLUORESCENCE M.S. Thesis
Edward Alan Watson 1982 82 p refs

(AD-A116744; AFIT/NR-82-5T) Avail: NTIS HC A05/MF A01 CSCL 20/6

The interaction of a light beam with matter has varying degrees of dependence on the transverse profile of the beam. Two topics are considered here. The first topic, superfluorescence, involves the coherent emission generated by an initially inverted two-level medium. Calculations in the past have included either quantum fluctuations in the initial conditions or transverse effects, but never both. The calculations presented here include both transverse effects and quantum fluctuations. The results of the theoretical calculations are in good agreement with previous experimental results, both quantitatively in terms of time delay averages and distributions and also qualitatively in terms of pulse shapes. The second topic considered, optical bistability, involves devices which exhibit two stable output light intensities (a high and a low branch) over a limited range of input light intensities. Simulations performed here show the effect of diffraction, measured in terms of the Fresnel number, on how much of the device becomes bistable. It was found that for small Fresnel number cases, the entire device become bistable. For high Fresnel number cases, only part of the device becomes bistable while the rest of the device remains low transmitting. The results of an experiment performed are consistent with the simulations. Author (GRA)

N82-32143# California Univ., Livermore. Lawrence Livermore Lab.

DIAMOND MACHINING AND MECHANICAL INSPECTION OF OPTICAL COMPONENTS

R. R. Donaldson, S. R. Patterson, and D. C. Thompson 13 Nov. 1981 11 p refs Presented at the Reflecting Optics Synchrotron Radiation Conf., Upton, N.Y., 18-20 Nov. 1981

(Contract W-7405-eng-48)

(DE82-003324; UCRL-86897; CONF-811120-2) Avail: NTIS HC A02/MF A01

Displacement measurement and motion control are discussed for rotary and linear axes of motion, as necessary for the dimensional meeasurement and diamond-tool machining of grazing incidence X-ray optics. Examples of available performance levels are drawn from measurements made on current development hardware, and are coupled with speculation on possible future extensions. DOE

N82-32144# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

PRODUCTION AND DETECTION OF UV RADIATION [PRODUZIONE E MISURA DELLA RADIAZIONE U.V.]

M. Cremonese and M. Matzeu 18 May 1981 64 p refs In ITALIAN; ENGLISH summary

(ISS-R-81/5; ISSN-0390-6477) Avail: NTIS HC A04/MF A01

Different ways to produce artificially UV radiation, uses in various fields (scientific, medical and industrial), detection and measuring are described. Measurements, including the determination of spectral distribution in the 200 to 400 nm band, and the angular power distribution of a solar lamp and a germicide UV lamp are presented. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-32145# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Plasma Physics lab.

EXPERIMENTAL WORK IN PLASMAS DEVELOPED AT INPE. 1: DOUBLE PLASMA MACHINE FOR THE STUDY OF LONGITUDINAL WAVES. 2: PLASMA CENTRIFUGE [TRABALHOS EXPERIMENTAIS EM PLASMA, DESENVOLVIDOS NO INPE. IMAQUINA DE PLASMA DUPLO PARA ESTUDO DE ONDAS LONGITUDINAIS. II-CENTRIFUGA DE PLASMA]

J. L. Ferreira, E. DelBosco, and G. O. Ludwig Feb. 1982 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Latin-Am. Meeting on Plasmas and Controlled Nucl. Fusion

(INPE-2321-PRE/077) Avail: NTIS HC A02/MF A01

A double plasma machine used to study ion acoustic wave propagation is described. A plasma centrifuge project is also described. Some basic parameters of the apparatus used for isotope separation through electromagnetic rotation of the plasma are included. S.L.

N82-32146# Iowa State Univ. of Science and Technology, Ames. Dept. of Chemistry.

ANALYTICAL SPECTROSCOPY WITH INDUCTIVELY COUPLED PLASMAS: PRESENT STATUS AND FUTURE PROSPECTS

V. A. Fassel 1981 12 p refs Presented at the 9th Intern. Conf. on Atomic Spectry., Tokyo, 4-8 Aug. 1981

(Contract W-7405-eng-82)

(DE82-003104; IS-M-343; CONF-810891-1) Avail: NTIS HC A02/MF A01

Inductively coupled Ar plasmas are simple and efficient devices for transforming liquid and solid aerosols, vapors, and gases at atmospheric pressure into free atoms, excited atoms, ions, and molecular fragements. Once these species are produced, they can provide the analyst with a wealth of information through their emission, fluorescence, absorption, and mass spectra. The physical and spectroscopic properties are reviewed followed by an update of their applications in emission, fluorescence, and mass spectroscopy. Specific topics highlighted are: ICP mass spectroscopy; isotopic abundance measurements via ICP atomic-emission spctroscopy; and a ICP wavelength atlas. Future projects on various forms of ICP spectroscopy are included. DOE

N82-32147# California Univ., Livermore. Lawrence Livermore Lab.

INTEGRATED OPERATIONS PLAN FOR THE MFTF-B MIRROR FUSION TEST FACILITY. VOLUME 2: INTEGRATED OPERATIONS PLAN

Dec. 1981 92 p

(Contract W-7405-eng-48)

(DE82-011074; UCRL-15430-Vol-2) Avail: NTIS HC A05/MF A01

An integrated plan for the operation of the mirror fusion test facility is presented. The plan delineates policies and provides for accomplishing the functions required by the program. The management, operations, maintenance, and engineering support responsibilities are specified. The plan covers phasing into sustained operations as well as the sustained operations themselves. DOE

N82-32148# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.

MODE COUPLING IN A TOROIDAL, SHARP-BOUNDARY PLASMA. 2: STRONG-COUPLING LIMIT

D. A. Dippolito and J. P. Goedbloed (Association Euratom-FOM, Rijnhuizen, Netherlands) Jan. 1982 34 p refs Sponsored in part by Stichting voor Fundamenteel Onderzoek der Materie (FOM), Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO), and Euratom

(Contract DE-AC03-76ET-53057)

(DE82-011547; SAI-254-82-443-LJ; PRI-39) Avail: NTIS HC A03/MF A01

Mode coupling in the discrete shear-Alfven spectrum of ideal magnetohydrodynamics can be caused either by toroidicity or by noncircularity of the plasma cross-section. The resulting localization of the eigenfunction leads to the formation of gaps in the frequency spectrum. This phenomenon is studied in the strong-coupling regime for both Tokamaks and screw pinches, and the implications for plasma stability and Alfven wave heating experiments are discussed. DOE

N82-32149# Los Alamos Scientific Lab., N. Mex.

EXPANSION OF IONS IN CONDUCTING FLUIDS WITH IMBEDDED MAGNETIC FIELDS

I. O. Bohachevsky, J. C. Goldstein, and D. O. Dickman Jan. 1982 14 p refs

(Contract W-7405-eng-36)
(DE82-010845; LA-9165-MS) Avail: NTIS HC A02/MF A01

Application of inertial confinement fusion was studied. A plasma model was developed composed of (1) a perfectly conducting fluid, (2) relatively energetic ions not in thermal equilibrium with the fluid, and (3) an electromagnetic field. Trajectories of the ions are determined from integration of the equations of motion for a statistically representative sample of simulation particles because the ion ranges in the fluid are compared to characteristic dimensions of containment vessels. The model constituents interact through electrodynamic and collisional forces, and through ionization and/or recombination processes. The finite difference equations describing these interactions are integrated numerically for an isotropic ion source located on the cylinder axis. It is indicated that there are distinctly different behaviors for low and high fluid densities. The ions expand in a diffuse cloud through low density fluids, but in high density fluids the ions aggregate into sheets that are perpendicular to the magnetic field. DOE

N82-32150# Los Alamos Scientific Lab., N. Mex.
PRELIMINARY LANGMUIR PROBE RESULTS ON THE CTX GUN EXPERIMENT
M. Tuszewski Dec. 1981 16 p refs
(Contract W-7405-eng-36)
(DE82-010024; LA-9120-MS) Avail: NTIS HC A02/MF A01

The Preliminary results obtained with a double Langmuir probe in the Compact Toroid experiment facility confirm the existence of a gun plasma of n approx. 5 x 10(14) cm(+3) and T approx. 10 eV lasting for approx. 250 to 400 (SIGMA)s, the results are consistent with interferometry and Thomson scattering data. The probe current characteristics as a function of voltage suggest non-Maxwellian features of the particles distribution functions. DOE

N82-32151# Los Alamos Scientific Lab., N. Mex.
ADVANCED-FUEL REVERSED-FIELD PINCH REACTOR (RFPR)
Randy L. Hagenson and Robert A. Krakowski Oct. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002387; LA-UR-81-3145; CONF-811040-46) Avail: NTIS HC A02/MF A01

The utilization of deuterium-based fuels offers the potential advantages of greater flexibility in blanket design, significantly reduced tritum inventory, potential reduction in radioactivity level, and utilization of an inexhaustible fuel supply. The conventional DT-fueled reversed-field pinch reactor (RFPR) designs reviewed, and the recent extension of these devices to advanced-fuel (catalyzed-DD) operation is presented. Attractive and economically competitive DD/RFPR systems are identified having power densities and plasma parameters comparable to the DT systems. Converting an RFP reactor from DT to DD primarily requires increasing the magnetic field levels a factor of two, still requiring only modest magnetic coil fields. When compared to the mainline tokamak, the unique advantages of the RFP (e.g., high beta, low fields at the coils, high ohmic-heating power densities, and unrestricted aspect ratio) are particularly apparent for the utilization of advanced fuels. DOE

N82-32152# Los Alamos Scientific Lab., N. Mex.
CONCEPTUAL DESIGN STUDIES OF THE MODULAR STELLARATOR REACTOR (MSR)
Ronald J. Miller and Robert A. Krakowski Oct. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002386; LA-UR-81-3146; CONF-811040-39) Avail: NTIS HC A02/MF A01

A preliminary conceptual study of the modular stellarator reactor (MSR) as a steady-state, ignited, DT-fueled, magnetic fusion reactor is presented. The MSR concept combines the physics of classic stellarator confinement with an innovative, modular coil design. Parametric tradeoff calculations are described, leading to the selection of an interim design point for a 4.8-GWt plant based on Alcator transport scaling and an average beta value of 0.04 in an 1 = 2 system with a plasma aspect ratio of 11. DOE

N82-32153# Los Alamos Scientific Lab., N. Mex.
QUASISTATIC EVOLUTION OF COMPACT TOROIDS
A. G. Sgro, R. L. Spencer, and C. Lilliequist 1981 5 p Presented at the 4th Symp. on the Phys. and Technol. of Compact Toroids, Livermore, Calif. 27-30 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002333; LA-UR-81-3161; CONF-811087-8) Avail: NTIS HC A02/MF A01

The post formation evolution of compact toroids was simulated. The simulations were performed with a 1-1/2 D transport code. The code makes use of the fact that the shapes of the flux surfaces in the plasma change much more slowly than do the profiles of the physical variables across the flux surfaces. The time evolution of these profiles are calculated as a function of a single variable that labels the flux surfaces. Occasionally, these profiles are used to invert the equilibrium equation to update the shapes of the flux surfaces. Shapes imply certain geometric cofficients, which contain the geometric information required by the 1-D equations. (GRA)

N82-32154# California Univ., Livermore. Lawrence Livermore Lab.
STREAKED SPECTROMETRY USING MULTILAYER X-RAY-INTERFERENCE MIRRORS TO INVESTIGATED ENERGY TRANSPORT IN LASER-PLASMA APPLICATIONS
G. L. Stradling, T. W. Barbee, Jr. (Stanford Univ., Calif.), B. L. Henke (Hawaii Univ., Honolulu), E. M. Campbell, and W. C. Mead Aug. 1981 16 p refs Presented at the Top. Conf. on Low-energy X-ray Diagnostics, Livermore, Calif., 8-10 Jun. 1981
(Contract W-7405-eng-48)
(DE82-000849; UCRL-85780; CONF-810651) Avail: NTIS HC A02/MF A01

Transport of energy in laser-produced plasmas is scrutinized by devising spectrally and temporally identifiable characteristics in the X-ray emission history which identify the heat-front position at various times in the heating process. Measurements of the relative turn-on times of these characteristics show the rate of energy transport between various points. These measurements can in turn constrain models of energy transport phenomena. Spectrally distinguishable subkilovolt X-ray emissions from different layers of a disk target to examine the transport rate of energy into the target are time resolved. A similar technique is used to measure the lateral expansion rate of the plasma spot. A soft X-ray streak camera with 15-psec temporal resolution is used to make the temporal measurements. Spectral discrimination of the incident signal is provided by multilayer X-ray interference mirrors. DOE

N82-32155# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN CONSIDERATIONS FOR AN INTERIAL CONFINEMENT FUSION REACTOR POWER PLANT
J. V. Massey and J. E. Simpson 10 Aug. 1981 4 p refs Presented at the Am. Nucl. Soc., San Francisco, 29 Nov. 1981 Prepared in cooperation with Bechtel Corp., San Francisco
(Contract W-7405-eng-48)
(DE81-030646; UCRL-15377) Avail: NTIS HC A02/MF A01

A conceptual design study to further define the engineering and economic concerns for inertial confinement fusion reactors is presented. Alternatives to the Livermore HYLIFE concept were examined and information from liquid metal cooled fast breeder reactor power plant studies was incorporated into the design. Laser and target physics models were employed in a reactor design with a low coolant flowrate and a high driver repetition rate. An example of such a design is the JADE concept. In addition to a power plant design developed using the JADE example, the applicability of the energy absorbing gas lithium ejector concept was investigated. DOE

N82-32156# California Univ., Livermore. Lawrence Livermore Lab.
FEASIBILITY STUDY OF A FISSION SUPPRESSED BLANKET FOR TANDEM-MIRROR HYBRID REACTOR
R. W. Moir, J. D. Lee, W. L. Barr, G. W. Hamilton, W. S. Neef, W. N. Kumai, W. R. Grimes, J. A. Maniscalco, D. H. Berwald, and R. B. Campbell 5 Oct. 1981 31 p refs Presented at the Meeting and Workshop on Fusion Reactor Design and Technol., Tokyo, 5-16 Oct. 1981
(Contract W-7405-eng-48)
(DE82-000736; UCRL-86756; CONF-811046-1) Avail: NTIS HC A03/MF A01

Fission suppressed blankets for the tandem mirror were determined to be feasible and safer than fissioning blankets. Such hybrids could produce enough fissile material to support up to 117 light water reactors of the same nuclear power rating. Beryllium was compared to 7Li for neutron multiplication; both were considered feasible but the blanket with Li produced 20% less fissile fuel per unit of nuclear power in the reactor. The beryllium resource, while possible being too small for extensive pure fusion application, would be adequate (with carefully planned industrial expansion) for the hybrid because of the large support ratio, and hence few hybrids required. DOE

N82-32157# California Univ., Livermore. Lawrence Livermore Lab.
WORK ON OPEN TRAPS IN THE USSR
D. D. Ryutov Oct. 1981 17 p refs Transl. into ENGLISH from IAEA Tech. Comm. Meeting on Open Confinement Systems, Novosibirsk, 1981 p 1-13
(Contract W-7405-eng-48)
(DE82-002145; UCRL-Trans-11730) Avail: NTIS HC A02/MF A01

A general review of the historical development and future plans for open plasma devices is given. The major characteristics of the AMBAL device (which is close to an ambipolar fusion reactor in terms of many dimensionless parameters that characterize the state of the plasma), of the GOL-3 multimirror trap, the OGRA-4 mirror trap, and the PSP-4 rotating plasma traps are presented. Transverse plasma losses due to the asymmetry of the magnet system and losses produced by plasma instabilities are discussed. Plasma control and plasma heating are considered. DOE

N82-32158# Los Alamos Scientific Lab., N. Mex.
MULTIPLE SOLUTIONS OF A FREE-BOUNDARY FRC EQUILIBRIUM PROBLEM IN A METAL CYLINDER
R. L. Spencer and Dennis W. Hewitt 1981 5 p refs Presented at the 4th Symp. on the Phys. and Technol. of Compact Toroids, Livermore, Calif., 27-30 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002328; LA-UR-81-3160; CONF-811087-3) Avail: NTIS HC A02/MF A01

A computation of FRC equilibria that avoids previously encountered difficulties is presented. For arbitrary pressure profiles it is computationally expensive, but for one special pressure profile the problem is simple enough to require only minutes of Cray time; it is this problem that was solved. The Grad-Shafranov equation, in an infinitely long flux conserving cylinder of radius a with the boundary conditions that psi(a,z) = psi/sub w/ and that delta psi/ delta z = 0 as [z] approaches infinity was solved. The pressure profile is p(psi) = cH(psi) where c is a constant and where H(x) is the Heaviside function. There is a purely vacuum state, two independent plasma solutions, and an r-z dependent plasma state. DOE

N82-32159# Los Alamos Scientific Lab., N. Mex.
PROPERTIES OF SPHEROMAKS GENERATED BY A MAGNETIZED COAXIAL SOURCE
H. W. Hoida, I. Henins, T. R. Jarboe, R. K. Linford, J. Lipson, J. Marshall, D. A. Platts, A. R. Sherwood, and M. Tuszewski 1981 7 p Presented at the 4th Symp. on the Phys. and Technol. of Compact Toroids, Livermore, Calif. 27-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002326; LA-UR-81-3155; CONF-811087-6) Avail: NTIS HC A02/MF A01

In gun-generated spheromaks impurity contamination plays an important role in determining the energy loss. Metallic impurities can be reduced by an appropriate change of source parameters. The reduction of the level of metal impurities results in a spectrum showing a preponderance of oxygen and carbon ines and OIV radiation is observed to increase indicating a warmer plasma. However, the plasma lifetime is not changed. Discharge cleaning techniques appear to be necessary. DOE

N82-32160# Los Alamos Scientific Lab., N. Mex.
ROTATIONAL INSTABILITIES IN THE FRC: RESULTS OF HYBRID SIMULATIONS
Douglas S. Harned 1981 5 p refs Presented at the 4th Sump. on the Phys. and Technol. of Compact Toroids, Livermore, Calif., 27-30 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002330; LA-UR-81-3158; CONF-811087-4) Avail: NTIS HC A02/MF A01

Simulations of rotational instabilities in the field reversed configuration (FRC) using a quasineutral hybrid simulation code, AQUARIUS, show that m = 2 instabilities can occur for levels of ion rotation well below thresholds predicted by previous theory. DOE

N82-32161# Los Alamos Scientific Lab., N. Mex.
INITIAL OPERATION OF FRX-C
W. T. Armstrong, R. R. Bertsch, J. C. Cochrane, R. W. Kewish, R. K. Linford, J. Linpson, K. F. McKenna, D. J. Rej, E. G. Sherwood, R. E. Siemon et al 1981 5 p refs Presented at the 4th Symp. on the Phys. and Technol. of Compact Toroids, Livermore, Calif., 27-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002331; LA-UR-81-3180; CONF-811087-1) Avail: NTIS HC A02/MF A01

A field reversed theta pinch experiment that has recently been placed into operation is described. Its objectives are to: (1) determine the scaling of field reversed configuration (FRC) confinement with size and clarify the mechanism(s) that limit confinement of an FRC; (2) increase the FRC lifetime by increasing the size by a factor of two (eight in volume) over past experiments; (3) form FRCs with temperatures in the 0.1 to 1.0 keV range and densities between 10 to the 15th power and 10 to the 16th power/cu cm; and (4) build on the results of the smaller FRX-A and FRX-B(1) experiments. Preliminary results are given based on the 42 plasma shots since the machine was placed into operation on September 2, 1981. Parameters of the experimental hardware are also given. DOE

N82-32162# Oak Ridge National Lab., Tenn. Fusion Engineering Design Center.
TOKAMAK BUILDING-DESIGN CONSIDERATIONS FOR A LARGE TOKAMAK DEVICE
Robert J. Barrett and Scott L. Thomson (Bechtel Corp., San Francisco, Calif.) 1981 4 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002798; CONF-811040-73) Avail: NTIS HC A02/MF A01

The feasibility of design and construction of a satisfactory Tokamak building to support the fusion engineering device (FED) is discussed. A pressure vessel building does not appear necessary to meet the plant safety requirements. Some of the building functions require safety class systems to assure reliable and safe operation. A rectangular Tokamak building selected for FED preconceptual design is described. The building is part of the confinement system, relying on ventilation and other design features to reduce the consequences and probability of radioactivity release. DOE

N82-32163# California Univ., Livermore. Lawrence Livermore Lab.
MICROWAVE INTERFEROMETER FOR PLASMA-DENSITY

MEASUREMENT ON TMX UPGRADE

F. E. Coffield, R. D. Stever, and N. P. Lund 25 Sep. 1981 5 p refs Presented at the 9th Symp. on Eng. Problems of Fusion Res., Chicago, 26-29 Oct. 1981

(Contract W-7405-eng-48)

(DE82-001594; UCRL-85950; CONF-811040-15) Avail: NTIS HC A02/MF A01

A four channel microwave interferometer operating at 140 GHz designed for installation on the upgrade to the tandem mirror experiment (TMX) is described. The instrument can be used to measure plasma density simultaneously at four locations: by reconnecting the waveguide runs, density can be measured at other locations of interest. The design is an outgrowth of a system used on TMX, but includes some newly developed hardware. An over-mode circular waveguide system is used to transport the signals over long distances with only moderate losses. Several precautions were taken to limit the effect of possible interference from the electron cyclotron resonant heating system used to heat the plasma. A high resolution linear phase comparator was designed that operates over the wide range of signals expected. A CAMAC-based data acquisition system provides for automatic data sampling and archival after each shot. DOE

N82-32164# Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif.

SHOT SYNCHRONIZATION FOR THE MIRROR FUSION TEST FACILITY

Ray Aley 1981 4 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981

(Contract DE-AC08-76NV-01183)

(DE82-001782; EGG-1183-4225; CONF-811040-22) Avail: NTIS HC A02/MF A01

Mirror Fusion Test Facility (MFTF) shot synchronization requires that the injection of plasma and the firing of start-up and sustaining neutral beams be coordinated to within milliseconds. In addition to these timing requirements, the state of the vacuum, magnet, and cryo- systems must be considered before the firing of any beam shots. Finally, the power company requires that conditioning shots be fired no more frequently than once a minute and physics shots no more than once in five minutes. This paper describes how these requirements are enforced by the shot-management software of the MFTF Supervisory Control and Diagnostic System. DOE

N82-32165# Los Alamos Scientific Lab., N. Mex.

MODULAR STELLARATOR FUSION REACTOR (MSR) CONCEPT

R. L. Miller and R. A. Krakowski 1981 17 p refs Presented at the 3rd IAEA Tech. Comm. and Workshop on Fusion Reactor Design and Technol., Tokyo, 5-16 Oct. 1981

(Contract W-7405-eng-36)

(DE82-000755; LA-UR-81-2878; CONF-811046-3) Avail: NTIS HC A02/MF A01

The Modulator Stellarator Reactor (MSR) as a steady state, ignited, DT fueled, magnetic fusion reactor was studied. The MSR concept combines the physics of classic stellarator confinement with an innovative, modular coil design. Parametric tradeoff calculations are described, leading to the selection of an interim design point for a 4.8 GWt plant based on Alcator transport scaling and an average beta value of 0.04 in an $1 = 2$ system with a plasma aspect ratio of 11. DOE

N82-32166# Los Alamos Scientific Lab., N. Mex.

RECENT STUDIES OF REVERSED FIELD PINCH REACTORS

R. L. Hagenson and R. A. Krakowski 1981 19 p refs Presented at the 3rd IAEA Tech. Comm. and Workshop on Fusion Reactor Design and Technol., Tokyo, 5-16 Oct. 1981

(Contract W-7405-eng-36)

(DE82-000693; LA-UR-81-2880; CONF-811046-5) Avail: NTIS HC A02/MF A01

The reactor prognoses of a class of confinement scheme that relies on self-fields induced by axial currents flowing within a plasma column are presented. The primary force is placed on the toroidal reversed-field pinch (RFP) reactor. At the limit of very large current densities is the gas-embedded dense Z-pinch (DZP), a small radius, linear device. Past conventional RFP reactor designs are reviewed. The extension of these conventional RFP reactors to DD advanced-fuel operation is described. The implications are summarized of operating higher density, compact RFP's as reactors, wherein the current density rather than physical dimensions are scaled. Lastly, the application of very high current densities supported in a submillimeter linear current channel, as enbodied in the DZP reactor is reviewed. DOE

N82-32167# Los Alamos Scientific Lab., N. Mex.

COMPACT-TOROID FUSION REACTOR (CTOR) BASED ON THE FIELD REVERSED THETA PINCH

R. L. Hagenson and R. A. Krakowski 1981 16 p refs Presented at the 3rd IAEA Tech. Comm. and Workshop on Fusion Reaction Design and Technol., Tokyo, 5-16 Oct. 1981

(Contract W-7405-eng-36)

(DE82-000694; LA-UR-81-2881; CONF-811046-6) Avail: NTIS HC A02/MF A01

Scoping studies of a translating compact torus reactor (CTOR) made on the basis of a dynamic plasma model and an overall systems approach are presented. This CTOR embodiment uses a field reversed theta pinch as a plasma source. The field reversed plasmoid would be formed and compressionally heated to ignition prior to injection into and translation through a linear burn chamber, thereby removing the high technology plasmoid source from the hostile reactor environment. Stabilization of the field reversed plasmoid would be provided by a passive conducting shell located outside the high temperature blanket but within the low field superconducting magnets and associated radiation shielding. On the basis of this batch burn but thermally steady state approach, a reactor concept emerges with a length below approximately 40 m that generates 300 to 400 MWe of net electrical power with a recirculating power fraction less than 0.15. DOE

N82-32168# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.

ANALYTIC BUMPY TORUS EQUILIBRIUM

R. D. Hazeltine (Texas Univ., Austin) and P. J. Catto Dec. 1981 25 p refs

(Contract DE-AC03-76ET-53057)

(DE82-011333; SAI-254-81-431-LJ; PRI-38) Avail: NTIS HC A02/MF A01

The equilibrium magnetic field of a bumpy torus confinement system is analyzed by expansion in the inverse aspect ratio. Decomposition of the plasma volume into low beta and high beta regions permits the derivation of relatively explicit formulae, which should be useful in bumpy torus transport and stability studies. In the low beta regions, which typically occupy most of the plasma volume, the magnetic field is computed through first order in the inverse aspect ratio, including plasma pressure correction terms. The high beta region is treated in a scalar pressure, thin ring approximation, without toroidal corrections; connection formulae for the change in flux surface geometry across the high beta annulus are obtained, together with an expression for the field inside the annulus. The analysis of both regions is completely general with respect to bump amplitude and bump shape. DOE

N82-32169# SRI International Corp., Menlo Park, Calif.

COLLISIONAL PROCESSES OF INTEREST IN MFE PLASMA RESEARCH Final Report, 1 Oct. 1975 - 31 Dec. 1981

R. E. Olson 31 Dec. 1981 18 p refs

(Contracts DE-AT03-76ET-53025; DE-AM03-76FO-0115)

(DE82-008027; SRI-PYU-5362) Avail: NTIS HC A02/MF A01

Progress on the following is reported: (1) $D+$ formation processes for ion source related work, (2) collisions between atomic H or D and multiply charged impurity ions for the diagnosis of plasma properties, and (3) the study of alpha particle collisions to determine confinement times. For topic theoretical calculations on the differential (angular) scattering of H0 and D0 on Cs were completed and the mechanisms and trends in the electron detachment cross sections for collisions of $H+$ and $D+$ with

alkali and heavy alkaline earth atom systems determined. For topic 2, a cross section scaling rule was determined for electron removal from atomic hydrogen by multiply charged ion collisions for charge states q = 1 to 50 and for collision energies from 50 to 5000 keV/amu. On topic 3, He + Li double electron capture and single ionization cross section calculations from 50 to 400 keV/amu were completed for use in studies on alpha distributions in magnetically confined plasmas. The cross section values are such that this diagnostic procedure appears tractable. DOE

N82-32170# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
TOROIDAL EXTRAP EQUILIBRIA Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)
J. Scheffel Apr. 1982 35 p refs
(TRITA-PFU-82-06; ISSN-0348-7644) Avail: NTIS HC A03/MF A01

Ideal MHD equilibria for the toroidal EXTRAP configuration were computed with an equilibrium code. The free-boundary problem was solved by using the condition that the current density is proportional to a cylinder coordinate on a flux surface. The toroidal zeta pinch, initially induced in the central zero-field region of a transverse octupole field, drifts radially outwards producing an inverse D shaped cross section. The plasma current of this high beta equilibrium can be increased if the plasma is pushed back by altering the external confining magnetic field.
Author (ESA)

N82-32171# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
PROPOSAL FOR TIME-RESOLVED ION TEMPERATURE MEASUREMENTS BY MEANS OF RUTHERFORD SCATTERING OF THE JET HEATING BEAMS
G. H. J. Notermans, H. W. vanderVen, and H. J. B. M. Brocken Jan. 1982 26 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-82-140) Avail: NTIS HC A03/MF A01

A diagnostic method for measuring ion temperatures, based on single Rutherford scattering of high energy neutral particles, injected into the plasma is presented. Plasma ion temperature can be monitored using only one detector line of sight. The JET neutral heating beams provide the neutral particles. With a time-of-flight velocity detector used in combination with the JET neutral injectors, a time resolution of 0.1 sec can be achieved. This very compact detection system has an energy resolution of at least 160 for a 35 cm long flight path. Calculations show a very low sensitivity of the device for background neutrons and gamma radiation. Author (ESA)

N82-32172# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
A SUMMARY OF PROCESSES RELEVANT FOR THE PARTICLE BALANCE OF A COLD PLASMA BLANKET CONTAMINATED WITH A SMALL AMOUNT OF HELIUM
J. H. H. M. Potters and W. J. Goedheer Apr. 1982 16 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-82-142) Avail: NTIS HC A02/MF A01

Information needed when modeling cold plasma, blankets is presented. Charge exchange, ionization, recombination, (de) excitation, and elastic scattering in a hydrogen plasma containing helium are discussed. Electrons, protons, hydrogen atoms (ground state, excited), alpha particles, He+ ions (ground state, excited) and helium ions (ground state, excited) are considered. Plasma temperature is below 100eV, electron density is between 3 times 10 to the 13th and 14th powers per cu cm. Author (ESA)

N82-32173# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
BEHAVIOR OF OXYGEN NEUTRALS IN THE BOUNDARY REGION OF TOKAMAK PLASMA Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)
M. Tendler May 1982 22 p refs Sponsored by Euratom
(TRITA-PFU-82-07; ISSN-0348-7644) Avail: NTIS HC A02/MF A01

Transport of oxygen atoms and molecules in a two-component plasma is considered. It is shown that the oxygen atoms consist of two components. One of them has a penetration depth typical of that of neutral hydrogen, while the other component has a penetration depth of the order of the total mean free path for the oxygen neutrals. The diffusion coefficient of the first ionization state of the oxygen is estimated and is shown to be enhanced by one order of magnitude as a result of penetrating the plasma.
Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N82-32174# Army Materials and Mechanics Research Center, Watertown, Mass.
PREPARATION AND PROPERTIES OF SOLID STATE MATERIALS. VOLUME 7: GROWTH MECHANISMS NAD SILICON NITRIDE
Donald R. Messier, William J. Croft, and William R. Wilcox, ed. (Clarkson Coll. of Technology) Jun. 1982 91 p refs
(DA Proj. 1L1-62105-AH-84)
(AMMRC-TR-82-42-Vol-7) Avail: NTIS HC A05/MF A01

The fabrication and physical properties of silicon nitride are discussed. Thermodynamic, optical, and electrical properties are discussed, as well as phase transformations and chemical behavior. Corrosion processes in combustion gases are discussed. R.J.F.

N82-32175# Wisconsin Univ., Madison. Mathematics Research Center.
A SINGULARLY PERTURBED BOUNDARY VALUE PROBLEM MODELLING A SEMICONDUCTOR DEVICE
Peter A. Markowich (Texas Univ., Austin), Chr. A. Ringhofer, Siegfried Selberherr, and Erasmus Langer May 1982 62 p refs Prepared in cooperation with Technische Univ., Vienna
(Contract DAAG29-80-C-0041)
(AD-A116213; MRC-TSR-2388) Avail: NTIS HC A04/MF A01 CSCL 20/12

This paper is concerned with the static, one dimensional modelling of a semiconductor device (namely the pn-junction) when a bias is applied. The governing equations are the well known equations describing carrier transport in a semiconductor which consist of a system of five ordinary differential equations subject to boundary conditions imposed at the contacts. Because of the different orders of magnitude of the solution components at the boundaries, we scale the components individually and obtain a singular perturbation problem. We analyse the equilibrium case (zero bias applied) and set up approximate models, posed as singularly perturbed second order equations, by neglecting the hole and electron current densities. This makes sense for small forward bias and for reverse bias. For the full problms we prove an a priori estimate on the number of electron-hole carrier pairs and derive asymptotic expansions (as the perturbation parameter tends to zero) by setting up the reduced system and the boundary layer system. We prove existence theorems for both systems and use the asymptotic expansion to solve the model equations numerically and analyse the dependence of the solutions on the applied bias. GRA

N82-32176# Missouri Univ., Columbia. Dept. of Physics.
EXCITATIONS OF THE SPIN-DENSITY WAVE IN PURE CHROMIUM
S. A. Werner, G. Shirane (Brookhaven National Lab.), C. R. Fincher (Brookhaven National Lab.), and B. H. Grier (Brookhaven National Lab.) 1981 13 p refs Presented at the Symp. on Neutron

Scattering, Argonne, Ill., 12 Aug. 1981
(DE81-031972; BNL-30084; CONF-810340-6) Avail: NTIS HC A02/MF A01

The magnetic excitations of the spin density wave (SDW) were investigated in pure Cr in both the low temperature longitudinally polarized phase (T < 122K) and in the higher temperature transversely polarized phase (122 K < T 312 K). In both phases spin wave modes of very high velocity observed originating from the incommensurate Bragg points. In the transversely polarized SDW phase new additional excitations are observed, centered in reciprocal space at the (1,0,0) commensurate point. These excitations are not affected by a magnetic field. Inelastic scattering in the paramagnetic phase above the Neel point (312 K) is observed in a reasonably well localized region of reciprocal space near (1,0,0) indicating that there are spin-spin correlations extending over many bcc unit cells and persisting to temperatures at least as high as 1.7 T sub N. DOE

N82-32177# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Section d'Etude des Solides Irradies.
IRRADIATION INDUCED DISORDER IN ORGANIC CONDUCTORS
L. Zuppiroli and S. Bouffard Aug. 1980 9 p refs Presented at the Intern. Conf. on Low Dimensional Synthetic Metals, Helsingor, Denmark, 10-15 Aug. 1980
(CEA-CONF-5434) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Experimental results concerning the transport properties of irradiated 1-D conductors are surveyed. The mechanisms which account for the changes in the dc conductivity either at high or low temperatures are considered. These mechanisms are: the 1-D blocking effects of defects and subsequent transverse fixed range phonon activated hopping of single electrons in the metallic regime, and the charge density waves pinning either in the metallic or the insulating regime. The difficulty between disordered systems and intrinsic or so-called pure ones is demonstrated. DOE

N82-32178# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
INELASTIC DEFORMATION IN CRYSTALLINE NONMETALLIC MATERIALS Progress Report
D. L. Kohlstedt Jan. 1982 36 p refs
(Contract DE-AS02-77ER-04441)
(DE82-007807; DOE/ER-04441/5) Avail: NTIS HC A03/MF A01

Progress made in the areas of hot pressing TiC + Ti powders, (2) analyzing Ti-TiC reaction couples, a TEM investigation of the defects produced in the Ti-TiC reaction, and deformation of TiC crystals are reported. High density TiC samples were prepared by hot pressing TiC + Ti powders at temperatures in the range 1200 to 16000C. The conversion of Ti to TiC is studied. The reaction layer contains high density of lamellar Ti-rich precipitates which have an orthorhombic structure. The deformation studies focused on load relaxation testing. The log sigma - log epsilon curves at 900 to 14000C are concave downward, typical of those seen in Ge above 6000C. The dislocation structure is dominated by interstitial and vacancy loops and by a high density of nodes. DOE

N82-32179# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
THEORY OF ELECTRON-PHONON SCATTERING EFFECTS IN METALS Final Report
W. E. Lawrence Dec. 1981 16 p refs
(Contract DE-AS02-76ER-02315)
(DE82-011326; DOE/ER-02315/17) Avail: NTIS HC A02/MF A01

The role of electron phonon scattering and other microscopic mechanisms in electron transport and related phenomena in metals was studied. The work is discussed in the context of developments in the same fields, and possible directions of future work are indicated. Published articles conference proceedings, unpublished technical reports and theses are referred to a complete listing of the reports is appended. DOE

N82-32180# Dartmouth Coll., Hanover, N.H.
REMARKS ON THE CONTRIBUTION OF ELECTRON-PHONON SCATTERING TO LOW-TEMPERATURE TRANSPORT COEFFICIENTS IN METALS
W. E. Lawrence Dec. 1981 58 p refs
(Contract DE-AS02-76ER-02315)
(DE82-010751; DOE/ER-02315/15) Avail: NTIS HC A04/MF A01

The technical difficulty of calculating the electron-phonon contribution to transport coefficients in very low temperature and how it can be substantially reduced is discussed. The collision operator reduces to the product of an integral operator on the energy dependence, with a differential operator on the angular dependence of the distribution function for electrical (or thermal) conduction. This simple asymptotic limit of the collision operator as T (FEMALEO is proven, and from it a number of results are derived. The results includes statements about the distribution function and the transport coefficients, simplified formulae that occur for collision matrix elements and for (-2)F(NU)) distributions appropriate to transport. DOE

N82-32181# Associated Technical Services, Inc., Glen Ridge, N.J.
METHOD OF PREPARING CUBIC POLYCRYSTALS OF BORON NITRIDE
L. F. Vereshchagin, F. I. Dubovitsky, A. N. Dremin, V. N. Slesarev, Y. A. Shifrin, E. N. Yakovlev, G. A. Adadurov, O. N. Breusov, T. V. Bavina, and E. S. Bogorodsky Jan. 1982 13 p refs Transl. into ENGLISH of Romanian Patent No. 63618 (1978)
(Contract DE-AC04-76DP-00789)
(DE82-007153; SAND-82-6004) Avail: NTIS HC A02/MF A01

Three methods for preparing cubic polycrystals of boron nitride are outlined. In the first method, powder is subjected to pressures above 40 kilobars and temperatures above 12000 C. The treatment is applied to a powder consisting principally of boron nitride of a denser modification which was previously subjected to a shock wave resulting in defects in the crystalline structure that favor the formation of hard polycrystals of boron nitride. In the second method, a powder of denser modification that is used consists of either powders of cubic boron nitride subjected to the action of a shock wave with an amplitude of at least 40 kilobars, or of a powder of boron nitride of the wurtzite modification obtained by the action of shock waves with an amplitude above 100 kilobars upon graphitic boron nitride. In the third method, the powder of denser modification consists of a mixture of 25 to 75% by weight of a powder of the wurtzite modification and 72 to 25% by weight of a powder of cubic boron nitride that has been previously subjected to the action of a shock wave. DOE

N82-32182# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
CSL/DSC LATTICE MODEL FOR GENERAL CRYSTAL-CRYSTAL BOUNDARIES AND THEIR LINE DEFECTS
R. W. Balluffi, A. Brokman, and A. H. King Dec. 1981 60 p refs
(Contract DE-AS02-78ER-05002)
(DE82-007799; DOE/ER-05002/18) Avail: NTIS HC A04/MF A01

The general CSL/DSC Lattice model for internal boundaries in crystalline materials is described. The model is essentially a fit-misfit model in which the regions of fit are patches where partial lattice matching across the boundary is achieved, and the regions of misfit are boundary line defects possessing dislocation/boundary step character. The degree of fit is effectively measured by the size of an appropriately chosen Coincidence Site Lattice (CSL) formed by the two lattices adjoining the boundary. The Burgers vectors of the line defects are vectors of an appropriately chosen DSC Lattice also formed by the two lattices adjoining the boundary, while the step vectors describing the step character are defined with the framework of the DSC Lattice. The model is extremely general and may be applied to grain boundaries in both cubic and non-cubic materials and interphase boundaries. Applications of the model to a variety of experimental results involving grain

boundaries and interphase boundaries are discussed. Some general assessment of the current status of the model is attempted. DOE

N82-32183# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.
ON THE EXISTENCE OF A NONUNIFORM SPIN-ISOSPIN ORDERED PHASE IN HIGH-DENSITY NEUTRON MATTER
O. Benhar 5 Jun. 1981 18 p refs Submitted for publication (ISS-P-81/6; ISSN-0390-6469) Avail: NTIS HC A02/MF A01

Using a Jastrow-like correlated wave-function and a realistic two-body interaction, the energy per particle of neutron matter was evaluated in the normal uniform phase and in a pi deg-condensed phase exhibiting one-dimensional density fluctuations and spin-isospin order. The numerical results indicate that the standard configuration is energetically favored, even at very high densities. Author (ESA)

N82-32184# Science Research Council, Chilton (England).
A COMPUTER STIMULATION STUDY OF THE CLASSICAL ISOTROPIC HEISENBERG CHAIN WITH AN APPLIED FIELD
E. Balcar and J. M. Loveluck 1981 22 p Prepared in cooperation with Atominatitut der Oesterreichischen Hochschulen
(PB82-161548; RL-81-093) Copyright. Avail: Issuing Activity CSCL 20L

Results are presented of a study of the classical, one dimensional, ferromagnetically-coupled Heisenberg magnet with an applied field. The variation of the spectrum of spin density fluctuations with temperature, applied field and wave-vector was investigated. The results at low temperature and strong applied field are shown to be consistent with noninteracting spin wave theory. At higher temperatures, and weaker fields qualitatively different behavior is observed. The modifications to the spectra are attributed to the thermally activated spin-energy density coupling, leading to a hybridized mode, which couples to both spin and energy densities. GRA

N82-32185# National Bureau of Standards, Washington, D.C. National Engineering Lab.
INVESTIGATION OF THE TWO-DIMENSIONAL SHAPE OF ION-IMPLANTED REGIONS Final Report
P. Roitman, J. Albers, J. R. Ehrstein, and D. R. Myers Dec. 1981 72 p refs Sponsored in part by Navy
(Contract DE-AC04-76DP-00789)
(PB82-154451; NBSIR-81-2398) Avail: NTIS HC A04/MF A01 CSCL 20L

The two dimensional shape of arsenic ion-implanted regions in single crystal silicon was investigated both experimentally and theoretically. Experimentally, two techniques were shown to have the necessary submicron resolution: a junction etch process and an SEM-induced current collection method. Junction depths determined by the etch technique, the EBIC technique, and spreading resistance are compared with the depths calculated using several amorphous target codes. GRA

N82-32070*# Alabama Univ., Huntsville. Dept. of Chemistry.
CRYSTALLIZATION OF BIOLOGICAL MACROMOLECULES IN A REDUCED GRAVITY ENVIRONMENT
Edward J. Meehan, Jr. *In its* UAH/NASA Workshop on Fluids Expt. System 1979 p 131-135 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32072*# Paris Univ. (France). Lab. de Mineralogie Cristallographie.
CRYSTAL GROWTH BY PRECIPITATION UNDER MICRO-GRAVITY
A. Authier, F. Lefaucheux, and M. C. Robert *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 147-153 refs Sponsored in part by CNES (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32073*# Stanford Univ., Calif. Center for Materials Research.
MORPHOLOGICAL STABILITY OF A CRYSTAL GROWING IN SOLUTION
Dennis Elwell *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 154-159 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32074*# State Univ. of New York at Buffalo, Amherst. Dept. of Chemical Engineering.
ANOMALOUS GROWTH OF SINGLE ICE CRYSTALS IN SOLUTION
William N. Gill *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 160-169 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32075*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
CONVECTIVE FLOW DURING DENDRITIC GROWTH
M. E. Glicksman and S. C. Huang *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 170-190 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32076*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
LOW DIMENSIONAL MAGNETIC SOLIDS AND SINGLE CRYSTAL ELPASOLITES: NEED FOR IMPROVED CRYSTAL GROWING TECHNIQUES
Mary L. Good, Steven Watkins, and Robert W. Schwartz *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 191-210 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32077*# Desert Research Inst., Reno, Nev. Atmospheric Sciences Center.
INFLUENCE OF CONVECTION ON FREE GROWTH OF DENDRITE CRYSTALS FROM SOLUTION
J. Hallett and E. Wedum *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 211-224 refs (For primary document see N82-32058 22-70)
(Grants NSF AER-75-19601; NSF ATM-77-07995)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32078*# Utah Univ., Salt Lake City. Dept. of Physics.
CONVECTIVE AND MORPHOLOGICAL INSTABILITY IN VAPOR CRYSTAL GROWTH
F. Rosenberger *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 225-232 refs (For primary document see N82-32058 22-70)
(Grants NsG-1534; NSF DMR-79-13183)
Avail: NTIS HC A12/MF A01 CSCL 20L

N82-32079*# Pennsylvania State Univ., University Park. Lab. of Materials Research.
CRYSTAL GROWTH OF SULFIDE MATERIALS FROM ALKALI POLYSULFIDE LIQUIDS
William B. White *In* Alabama Univ. UAH/NASA Workshop on Fluids Expt. System 1979 p 233-240 refs (For primary document see N82-32058 22-70)
Avail: NTIS HC A12/MF A01 CSCL 20L

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-32186*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 1: PROPERTIES IN SI UNITS

Sanford Gordon Jul. 1982 397 p refs
(NASA-TP-1906; E-946; NAS 1.60:1906) Avail: NTIS HC A17/MF A01 CSCL 20M

Thermodynamic and transport combustion properties were calculated for a wide range of conditions for the reaction of hydrocarbons with air. Three hydrogen-carbon atom ratios (H/C = 1.7, 2.0, 2.1) were selected to represent the range of aircraft fuels. For each of these H/C ratios, combustion properties were calculated for the following conditions: Equivalence ratio: 0, 0.25, 0.5, 0.75, 1.0, 1.25 Water - dry air mass ratio: 0, 0.03 Pressure, kPa: 1.01325, 10.1325, 101.325, 1013.25, 5066.25 (or in atm: 0.01, 0.1, 1, 10, 50) Temperature, K: every 10 degrees from 200 to 900 K; every 50 degrees from 900 to 3000 K Temperature, R: every 20 degrees from 360 to 1600 R; very 100 degrees from 1600 to 5400 R. The properties presented are composition, density, molecular weight, enthalphy, entropy, specific heat at constant pressure, volume derivatives, isentropic exponent, velocity of sound, viscosity, thermal conductivity, and Prandtl number. Property tables are based on composites that were calculated by assuming both: (1) chemical equilibrium (for both homogeneous and heterogeneous phases) and (2) constant compositions for all temperatures. Properties in SI units are presented in this report for the Kelvin temperature schedules. Author

N82-32187*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 2: COMPOSITIONS CORRESPONDING TO KELVIN TEMPERATURE SCHEDULES IN PART 1

Sanford Gordon Jul. 1982 281 p refs
(NASA-TP-1907; E-947; NAS 1.60:1907) Avail: NTIS HC A13/MF A01 CSCL 20M

The equilibrium compositions that correspond to the thermodynamic and transport combustion properties for a wide range of conditions for the reaction of hydrocarbons with air are presented. Initially 55 gaseous species and 3 coin condensed species were considered in the calculations. Only 17 of these 55 gaseous species had equilibrium mole fractions greater than 0.000005 for any of the conditions studied and therefore these were the only ones retained in the final tables. J.M.S.

N82-32188*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 3: PROPERTIES IN US CUSTOMARY UNITS

Sanford Gordon Jul. 1982 362 p refs
(NASA-TP-1908; E-948; NAS 1.60:1908) Avail: NTIS HC A16/MF A01 CSCL 20M

Thermodynamic and transport properties are presented for a wide range of conditions for the reaction of hydrocarbons with air. The values given are in U.S. customary units. J.M.S.

N82-32189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 4: COMPOSITIONS CORRESPONDING TO RANKINE TEMPERATURE SCHEDULES IN PART 3

Sanford Gordon Jul. 1982 281 p refs
(NASA-TP-1909; E-949; NAS 1.60:1909) Avail: NTIS HC A18/MF A01 CSCL 20M

The equilibrium compositions corresponding to the thermodynamic and transport combustion properties for a wide range of conditions for the reaction of hydrocarbons with air are presented. The compositions presented correspond to Rankine temperature schedules. J.M.S.

N82-32190# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THERMAL RADIATION FROM HOT SURFACES MEASURED BY OPTICAL AND CALORIMETRIC METHODS M.S. Thesis

Gerald Thomas OConnor 1982 106 p refs
(AD-A116737; AFIT/NR-82-3T) Avail: NTIS HC A06/MF A01 CSCL 20/13

The radiative heat loss from a surface is determined by its total hemispherical emittance, which consequently plays an important role in aerospace and solar applications. This study compares emittances measured calorimetrically with values derived from near normal incidence spectral reflectance measurements. This optical derivation is based on a number of assumptions which limit the accuracy if not sufficiency fulfilled. These assumptions include sample specularity, a straybody character beyond the range of measurement, only small variations of emittance with temperature, and a perfectly smooth sample surface. The comparison of calorimetrically and optically derived emittance performed in this study not only quantifies the errors introduced by insufficient fulfillment of the assumptions but also identifies which assumption causes the dominant error. The calorimetric emissometer, constructed for this study and based on a heat flow sensor, was calibrated with aluminum and nickel thin films, resulting in good agreement with literature values. GRA

N82-32191# Nordisk Institut for Teoretisk Atomfysik, Copenhagen (Denmark).

THE CROSS-OVER POINTS IN LATTICE GAUGE THEORIES WITH CONTINUOUS GAUGE GROUPS

P. Cvitanovic, J. Greensite (Niels Bohr Inst., Copenhagen), and B. Lautrup (Niels Bohr Inst., Copenhagen) Jun. 1981 14 p refs
(DE81-700816; NBI-HE-81-26) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The authors obtain a closed expression for the weak-to-strong coupling cross-over point in all Wilson type lattice gauge theories with continuous gauge groups. A weak coupling expansion of the mean field self-consistency equation is used. In all cases where the results can be compared with Monte Carlo calculations the agreement is excellent. DOE

N82-32192# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

FLUID THERMODYNAMICS

Robert Legendre Jul. 1982 30 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-778)
(ONERA-NT-1982-1; ISSN-0078-3781; ESA-TT-778) Avail: NTIS HC A03/MF A01

The principles of macroscopic thermodynamics are introduced. Enthalpy, heat, and internal energy are explained. Thermal power machines and energy conservation are discussed. The entropy of two-parameter systems, and the Carnot cycle are examined. Irreversible cycles, and thermodynamic potential are treated. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-32193# Research Inst. of National Defence, Stockholm (Sweden).

EVALUATION OF ORGANIZATION DEVELOPMENT (OD). A LITERATURE REVIEW
Aake Philips May 1982 67 p refs
(FOA-C-55054-H3) Avail: NTIS HC A04/MF A01

Literature on organiztion development (OD) evaluation was reviewed. The selection of the purpose of, and the audience for the evaluation are discussed. The formulation and selection of evaluation criteria and the selection of evaluation variables are considered. Methodologies, e.g., questionnaires, interviews, are outlined. The choice of an optimal evaluation design is treated. Failures and defects in OD evaluations are attributed to the use of positivistic, functionalistic, science standards. Action science and hermenentical approaches are suggested as alternatie means to ensure the validity and utility of OD evaluations. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N82-32194*# National Aeronautics and Space Administration, Washington, D. C.
NASA 1981 PHOTOGRAPHY INDEX
[1982] 248 p
(NASA-TM-84835; NAS 1.15:84835) Avail: NTIS HC A11/MF A01 CSCL 05B

An index of representative photographs is presented. Color transparencies and black and white glossies of major launches, Mariner spacecraft, Pioneer spacecraft, planets and other space phenomena, Skylab, space shuttle, Viking spacecraft, and Voyager spacecraft are included. S.L.

N82-32195# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYSTEM FOR RETRIEVING DOCUMENTARY DATA M.S. Thesis [SISTEMA DE RECUPERACAO DE DADOS DOCUMENTARIOS]
Silvia deOliveira Barcellos Feb. 1982 136 p refs In PORTUGUESE; ENGLISH summary
(INPE-2312-TDL/076) Avail: NTIS HC A07/MF A01

Synbax and semantics for a query language are proposed. The construction of an information retrieval system based on this language is discussed. An approximation of the time and space complexities of such a system and an example of batch execution are given. Author

N82-32196# Brookhaven National Lab., Upton, N. Y.
SUMMARY OF THE ACTIVITIES OF THE SUBGROUP ON DATA ACQUISITION AND PROCESSING
1981 20 p Presented at the Phys. Opportunities at ISABELLE Summer Workshop, Upton, N.Y., 20 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-002249; BNL-30169; CONF-810759-7) Avail: NTIS HC A02/MF A01

Contributions were made by representatives of BNL experiments 734, 735, and the MPS, as well as the Fermilab Colliding Detector Facility and the SLAC LASS Facility. The subgroup did not divide its activities into investigations of various individual detectors, but instead attempted to review the current state of the art in the data acquisition, trigger processing, and data handling fields. A series of meetings first reviewed individual pieces of the problem, including status of the Fastbus Project, the Nevis trigger processor, the SLAC 168/E and 3081/E emulators, and efforts within DAG. Additional meetings dealt with the question involving specifying and building complete data acquisition systems. For any given problem, a series of possible solutions was proposed by the members of the subgroup. DOE

N82-32197# Idaho National Engineering Lab., Idaho Falls.
ISDMS (RELEASE 1.2) (A SCIENTIFIC DATA MANAGEMENT SYSTEM)
Kenneth D. Russell, Harry R. Bruestle, D. M. Snider, and H. D. Stewart Aug. 1981 1594 p
(Contract DE-AC07-76ID-0170)
(DE82-001006; EGG-IS-5528; EGG-IS-5287) Avail: NTIS HC A99/MF A01

The Idaho National Engineering Laboratory Scientific Data Management System (ISDMS), is a generalized scientific data processing system designed to meet the needs of the various user groups at the Idaho National Engineering Laboratory (INEL). This system evolved from the need to consolidate the various data processing activities at the INEL into a common data processing system. This document, the first in a series of documents, is intended to serve as an overview of Release 1.2 of ISDMS. Included in this overview are the ISDMS historical background, ISDMS design philosophy, ISDMS system description, and ISDMS reference section. DOE

N82-32198# Sandia Labs., Albuquerque, N. Mex.
DOCUMENT INVENTORY CONTROL AND INFORMATION RETRIEVAL
T. D. Sullivan 1981 7 p refs Presented at DRS Users Soc. Meeting, Boston, 15 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-002444; SAND-81-2534C; CONF-811138-1) Avail: NTIS HC A02/MF A01

The data base record structure that was implemented to achieve the inventory control and information retrieval functions is described. DOE

N82-32199# California Univ., Berkeley. Lawrence Berkeley Lab.
SEEDIS PROJECT: A SUMMARY OVERVIEW
J. L. McCarthy, D. W. Merrill, A. Marcus, W. H. Benson, F. C. Gey, H. Holmes, and C. Quong Sep. 1981 31 p refs
(Contract W-7405-eng-48)
(DE82-001335; PUB-424) Avail: NTIS HC A03/MF A01

The SEEDIS project addresses information needs and problems through research, design, development, and demonstration of information system components. SEEDIS software provides a unified framework for data management, information retrieval, statistical analysis, and graphical display. Using SEEDIS, nonprogrammer users can efficiently access and manipulate large, diverse, and distributed statistical data base. DOE

N82-31745# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
DIGITIZATION OF THE NOAA/NESS CONTINENTAL SNOW COVER DATA BASE
Michael Matson and Marylin S. Varnadore *In* International Geophysical Year World Data Center A Snow Watch 1980 Oct. 1981 p 123-128 ref (For primary document see N82-31731 22-42)
Avail: NTIS HC A07/MF A01 CSCL 08L

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N82-32200*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ESCALATOR DESIGN FEATURES EVALUATION Final Report
Wayne F. Zimmerman and Govind K. Deshpande 1 Jul. 1981 50 p refs Sponsored in part by DOT
(Contract NAS7-100)
(NASA-CR-169266; JPL-Publ-81-78; NAS 1.26:169266; UMTA-MA-06-0025-81-3) Avail: NTIS HC A03/MF A01 CSCL 13F

Escalators are available with design features such as dual speed (90 and 120 fpm), mat operation and flat steps. These design features were evaluated based on the impact of each on capital and operating costs, traffic flow, and safety. A human factors engineering model was developed to analyze the need for flat steps at various speeds. Mat operation of escalators was found to be cost effective in terms of energy savings. Dual speed operation of escalators with the higher speed used during peak hours allows for efficient operation. A minimum number of flat steps required as a function of escalator speed was developed to ensure safety for the elderly. Author

N82-32201# Oak Ridge National Lab., Tenn. Energy Div.
POTENTIAL FOR DISTRICT HEATING: AN HISTORICAL OVERVIEW
Martin A. Broders Oct. 1981 73 p refs
(Contract W-7405-eng-26)
(DE82-001959; ORNL/TM-7791) Avail: NTIS HC A04/MF A01

A brief historial overview of district heating is presented. Attention is focused on the potential of district heating to meet our nation's energy conservation, environmental, and social objectives. Basic terms are defined and the principle of district heating operation is described. District heating thermal energy sources, transmission and distribution piping, and consumer secondary heating systems are discussed in very general terms. For comparison, the history and status of district heating in Europe is also summarized. The advantages of district heating are outlined, and the primary factors that impeded the implementation of district heating in the United States are discussed. DOE

N82-32202# Los Alamos Scientific Lab., N. Mex.
LIQUID-HYDROGEN-FUELED-VEHICLE TESTS: EXECUTIVE SUMMARY
W. F. Stewart 1981 39 p refs Presented at Automotive Tech. Development Contractor Coordination Meeting, Dearborn, Mich., 26 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002352; LA-UR-81-3194; CONF-811090-1) Avail: NTIS HC A03/MF A01

A baseline liquid hydrogen fueled vehicle and a liquid hydrogen refueling system were completed. The vehicle was refueled at least 60 times with liquid hydrogen using various liquid hydrogen storage Dewars and a semiautomatic refueling station. The engine was operated for 133 h and the car was driven for 3540 km (2200 miles) on hydrogen without any major difficulties. The vehicle obtained 2.4 km/L (5.7 miles/gal) of liquid hydrogen or 8.9 km/L (21 miles/gal) of gasoline on an equivalent energy basis for driving in the high altitude Los Alamos, Santa Fe, and Albuquerque areas. Without refueling, the car had a range of about 274 km (170 miles) with the first liquid hydrogen tank and about 362 km (225 miles) with the second tank. DOE

N82-32203# Department of Energy, Washington, D. C.
STATE-OF-THE-ART ASSESSMENT OF METHANE-FUELED VEHICLES
Feb. 1982 12 p refs
(DE82-009287; DOE/CE-0026) Avail: NTIS HC A02/MF A01

The desirability of methane, either in the form of compressed natural gas or liquefied natural gas, as a fuel for spark-ignition and compression-ignition engines in vehicles was studied by considering the attributes and disadvantages of methane as a vehicle fuel, the availability of engines designed for methane operation, the cost of engine conversion systems, on-vehicle fuel storage systems, enviromental effects, vehicle performance, safety, economics, fueling facilities and domestic supplies of methane. DOE

N82-32204# Department of Energy, Washington, D. C.
ELECTRIC AND HYBRID VEHICLES PROGRAM Annual Report to Congress, Fiscal Year 1981
Mar. 1982 21 p refs
(DE82-009484; DOE/CE-0028; AR-5) Avail: NTIS HC A02/MF A01

The emphasis in the Electric and Hybrid Vehicles Program shifted from vehicle demonstration and preparation for production readiness to research, development, test, and evaluation of advanced technologies to achieve the attributes necessary to make electric and hybrid vehicles a practical transportation alternative. Research and development efforts in batteries and propulsion components, as well as total vehicle systems, continue to reveal significant progress toward providing industry with technology options that will result in vehicles with greater public acceptance. DOE

N82-32205# Transportation Systems Center, Cambridge, Mass.
INTERIM ASSESSMENT OF THE VAL AUTOMATED GUIDEWAY TRANSIT SYSTEM Interim Report, Aug. 1980
G. Anagnostopoulos Nov. 1981 199 p Prepared in cooperation with Inst. de Recherche des Transports
(Contract MA-06-0069)
(PB82-163783; UMTA-MA-06-0069-81-3; DOT-TSC-UMTA-81-34) Avail: NTIS HC A09/MF A01 CSCL 13F

An interim assessment was made of the VAL (Vehicules Automatiques Legers or Light Automated Vehicle) AGT system which is currently under construction in Lille, France. The system operates at grade, elevated, and in tunnels on an exclusive concrete dual-lane guideway that is 12.7 kilometers long. The configuration of the system is a push-pull loop operating between 17 on-line stations. The system is designed to provide scheduled operation at 60-second headways and a normal one-way capacity of 7440 passengers per hour per direction with 55 percent of the passengers seated. During the course of the demonstration test program, VAL demonstrated that it could achieve high levels of dependability and availability and could perform safely under all perceivable conditions. GRA

88 SPACE SCIENCES (GENERAL)

N82-32206# Centre National de Recherches de l'Espace, Brussels (Belgium).
SPACE RESEARCH IN BELGIUM Annual Report, 1981
1982 32 p refs Presented at 24th COSPAR Plenary Meeting, Ottawa, 17 May-2 Jun. 1982 Sponsored in part by Academie

Royale de Belgique Koninklijke Academie van Belgiee
Avail: NTIS HC A03/MF A01

Research concerning space aeronomy, astrophysics, astronomy, space geodesy, metallurgy, and meteorology is summarized. Stratospheric ions, atmospheric structure, plasmapause formation, and solar wind plasma were studied. The interaction of energetic electrons with the Jupiter and Saturn atmospheres, the solar X-ray spectrum, and Beta Cephei variable stars were investigated. The solar constant and the Earth radiation budget were examined. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-32207*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIRTF - THE SHUTTLE INFRARED TELESCOPE FACILITY
Michael W. Werner and Fred C. Witteborn Aug. 1982 16 p refs (NASA-TM-81322; A-9049; NAS 1.15:81322) Avail: NTIS HC A02/MF A01 CSCL 03A

The Shuttle Infrared Telescope (SIRTF) is a 1-m class cryogenically cooled telescope to be operated from the shuttle as a facility for infrared astronomy. By exploiting the very low infrared background of space, SIRTF will achieve 100 to 1000 times the sensitivity currently attainable at infrared wavelengths between 2 and 200 microns. The scientific requirements of SIRTF, the current design concept, and the scientific capabilities of the systems are reviewed. We also review recent experimental results showing that mirrors made of glassy materials may be suitable for use in large cryogenic telescopes such as SIRTF. Author

N82-32208*# Alabama Univ., Birmingham.
EXTENDED RANGE X-RAY TELESCOPE: X-RAY MICROSCOPE DESIGN Final Report, 29 Jan. - 28 Jun. 1982
D. L. Shealy, A. Kassim, and S. Chao 30 Jul. 1982 118 p refs (Contract NAS8-34728)
(NASA-CR-162072; NAS 1.26:162072) Avail: NTIS HC A06/MF A01 CSCL 03A

A glancing incidence X-ray microscope using a confocal hyperboloid ellipsoid mirror was designed to couple optically a Wolter 1 telescope to a CCD focal plane detector. Both the RMS spot size and the point spread function calculations were used to evaluate the resolution, defocusing, and vignetting effects of the system for microscope focal lengths of 1, 1.5, and 2 meters and for magnifications varying from 2 to 10x. For the specific application with the S-056 telescope, a 2 meter, 8x microscope with a fabrication ratio of the microscope mirror length to the inner diameter at hyperboloid ellipsoid intersection of 2.5 was designed to be used with a thinned, back illuminated CCD detector array with 320 by 512, 30 micron pixels. S.L.

N82-32209# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.
LEST: LARGE EUROPEAN SOLAR TELESCOPE
Oddbjoern Engvold and Manfred Hefter 30 Apr. 1982 261 p refs Sponsored by Royal Swedish Academy of Sciences, Norwegian Research Council for Science and the Humanities and Swedish Research Council for Natural Science. Prepared for the Joint Organization for Solar Observations
Avail: NTIS HC A12/MF A01

Factors affecting the design, manufacture, and performance of the large European solar telescope (LEST) are considered. The effects of turbulence and vibrations on image quality are discussed. Various optical systems are compared. Telescope architecture is dealt with. Window concepts and image magnification are treated. For individual titles, see N82-32210 through N82-32225.

N82-32210# Oslo Univ. (Norway).
ATMOSPHERIC SEEING AND TELESCOPE VIBRATIONS
In its LEST: Large European Solar Telescope 30 Apr. 1982 p 7-26 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

The effects of upper atmosphere and ground level air turbulence and of structural vibration on telescope image quality are discussed. Turbulence due to thermal properties of the ground, topology, and the telescope tower and dome is considered. Correction for atmospheric seeing for high spatial resolution solar observations is restricted to a few 100 A bandwidth, so the need to minimize turbulence, e.g., by removing obstacles which deflect turbulence layers into the telescope line of sight, is stressed. The replacement of air by helium in the telescope tube is suggested as a means to overcome heating of optical components. Telescope vibrations can be reduced by having support structures with natural frequencies as high as possible. Author (ESA)

N82-32211# Oslo Univ. (Norway).
MEANS FOR REDUCING EFFECTS OF SEEING AND TELESCOPE VIBRATIONS
In its LEST: Large European Solar Telescope 30 Apr. 1982 p 27-56 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

The choice of location for the large European solar telescope at a given site, reduction of ground layer turbulence generated by the natural surface of the site, and minimizing turbulence caused by the facility itself are discussed. Ways to reduce vibrations in the tower and telescope, and optical means for reduction of effects of atmospheric seeing, residual instrumental vibrations, and telescope aberrations are considered. Author (ESA)

N82-32212# Oslo Univ. (Norway).
BUILDING RELATED MATERIALS
In its LEST: Large European Space Telescope 30 Apr. 1982 p 57-99 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

Functional and climatic conditions which influence the location and design of the large European solar telescope (LEST) are discussed, and the integration of the whole facility, especially dome and telescope, is advocated. The LEST dome-mount proposed consists of two sections with a lower horizontal joint and upper inclined circular joint. The primary mirror can be supported by a ring attached to the upper section. The optical element can be integrated with, or separated from, the tube vacuum enclosure. A 35 m tower lifts the instrument clear of ground convection turbulence, and a conical closed concrete structure has the necessary aerodynamic and vibration properties. A prestressed cable network roof structure, with tube columns is suggested.
Author (ESA)

N82-32213# Oslo Univ. (Norway).
TELESCOPE MOUNTING
In its LEST: Large European Solar Telescope 30 Apr. 1982 p 100-106 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

A mounting consisting of two revolving sections of a spherical shell is considered for the large European solar telescope. The lower section rotates about a vertical axis, and the upper section revolves on a circular bearing on the lower part. This concept allows for a well balanced and compact design. It may permit a domeless design, leading to substantial weight reduction pointing and tracking are easy, computerized, and robust. However, the telescope tube and its optical system rotate with respect to the plane of the direction of gravity. Tracking very close to the horizon and near zenith is precluded by acceleration strains on drives and bearings, although for solar observations this is not a serious drawback. The design is susceptible to wind induced vibrations. It is therefore of interest mainly in combination with an adequate active optical image stabilization scheme. Author (ESA)

N82-32214# Oslo Univ. (Norway).
TRIPLE MIRROR COELOSTAT
In its LEST: Large European Solar Telescope 30 Apr. 1982 p 106-108 (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

The use of a three mirror combination to provide a nonrotating solar image, and to meet large European solar telescope requirements for a compact design which can operate in a vacuum enclosure is described. The primary mirror (M1) rotates about the polar axis at half the angular rate of the Earth. The secondary (M2) intercepts the beam from M1 and directs it onto M3, which is mounted behind and north of M1. The beam is thence directed towards the image forming elements of the optical system. The position of M2 can be changed without affecting the orientation and position of the exit beam. Author (ESA)

N82-32215# Oslo Univ. (Norway).

ALTERNATIVE OPTICAL SYSTEMS FOR THE LARGE EUROPEAN SOLAR TELESCOPE (LEST)

In its LEST: Large European Solar Telescope 30 Apr. 1982 p 109-131 (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

The Ritchey-Chretien (A), concurrent (B), Gregorian (C), heliostat-single spherical mirror (D), and heliostat-Cassegrain Schiefspiegler systems (D) are considered in view of the large European solar telescope requirements, e.g., as to number of optical elements, field of view, and instrument polarization. The 0.1 arcsec spatial resolution can only be met by using a multiple element window with any of the systems. Systems A, B, and C meet the need for low polarization. Systems D and E provide largest field of view. System D has two mirrors, B, C, and E have four. Direct pointing approaches (A, B, C) produce thermal problems, but thermal control, using heat rejecting systems, can overcome these for cases A and B. System C has no heating of the secondary mirror. Overall, systems A, B, and C best match specifications. Author (ESA)

N82-32216# Oslo Univ. (Norway).

A DESIGN FOR THE LARGE EUROPEAN SOLAR TELESCOPE (LEST)

In its LEST: Large European Solar Telescope 30 Apr. 1982 p 132-177 refs (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

The physical implications of adopting a Ritchey-Chretien plus triple coelostat design for the large European solar telescope are discussed. Two hyperbolically figured mirrors form an image in an aplanatic focus that is free from spherical aberration and coma. The heat rejecting system has to cope with between 4 and 5 KW energy. The modulation transfer function is 0.20 for 0.1 arcsec spatial resolution. The reimaging system can be either an inverted quasi-Cassegrain system, or a triplet apochromatic lens system. A coelostat mirror can act as a deformable phase plate for a real time atmospheric compensation system. Only a coelostat mounting provides a nonrotating image in the final image plane. The image stabilization system must handle peak to peak motions of from 3 to 4 arcsec, and frequencies up to 50 Hz. Telescope mount, cladding, and tower options are discussed. Author (ESA)

N82-32217# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.

THE SPREAD FUNCTIONS AND MODULATION TRANSFER FUNCTIONS FOR THE APERTURE UNDER DISCUSSION

Rolf Brahde *In its* LEST: Large European Solar Telescope 30 Apr. 1982 p 179-186 refs (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

Spread and modulation transfer functions for: (1) the aperture of a Cassegrain telescope with main mirror radius of 125 cm and central obscuration radius of 35 cm; (2) a similar aperture, but with six circular support pads for a window, of radius 10 cm at a distance of 83.3 cm from the center (the support pads acting as additional obscurations); (3) an aperture consisting of six circular windows inscribed in a circle of radius 125 cm whose total area corresponds to the area of a circle of radius 107.09 cm, including a central obscuration circle with a radius of 35 cm; and (4) an annular aperture with radii 107.09 cm and 35 cm, corresponding to the area in case three were computed. The Rayleigh criterion for a circular aperture corresponds to a modulation of 0.1538. For an object consisting of parallel black and white stripes, this occurs for 0.05 arcsec. Resolution of 0.1 arcsec is reached with a modulation of 0.20 for apertures one to four. Author (ESA)

N82-32218# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.

POSITIONS AND ANGLES OF THE THREE MIRROR COELOSTAT

Rolf Brahde *In its* LEST: Large European Solar Telescope 30 Apr. 1982 p 187-193 (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

Formulas for the combination of three plane mirrors, using solar altitude and azimuth, are developed. The direction from the center of the primary mirror (PM) to the solar image reflected by this mirror is the direction to the secondary mirror. The plane of incidence at PM can be determined either from the fact that it contains the directions to the Sun and to the secondary mirror with direction cosines, of from the direction to the Sun and the normal to the primary, with the direction cosines. The third mirror is positioned directly north of PM, and the angles of incidence and reflection at the mirrors are deduced from the direction of the Sun, the directions between the mirrors, and the direction from mirror three vertically downwards. For the large European solar telescope the exit the exit pupil is imaged on mirror three, so the sum of the distances between mirrors one and two and between mirrors two and three must be kept constant.

Author (ESA)

N82-32219# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.

MOTION OF THE LARGE EUROPEAN SOLAR TELESCOPE (LEST) MOUNTING

Rolf Brahde *In its* LEST: Large European Solar Telescope 30 Apr. 1982 p 194-198 (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

The motion of the large European solar telescope about two axes of rotation, defined by the zenith and a point (R) inclined at an angle of 90 deg minus the value of a given angle (i) is analyzed. The telescope is assumed to track the Sun at different times of the year, and to be located at 28 deg N. The telescope is connected to the upper hemisphere in K, at a position 90 deg minus q from R. If the telescope is required to point at the zenith, it is shown that q = 90 deg - i must be defined. Two solutions, defined by solar declination limits, are possible and can be selected depending on the time of day. Author (ESA)

N82-32220# Freiburg Univ. (West Germany). Kiepenheuer-Inst. Fuer Sonnenphysik.

WINDOW FOR VACUUM TELESCOPES: REVIEW OF PROBLEM AREAS

J. P. Mehltretter *In* Oslo Univ. LEST: Large European Solar Telescope 30 Apr. 1982 p 199-204 refs (For primary document see N82-32209 22-89)

Avail: NTIS HC A12/MF A01

The mechanical properties of a large disk of BK7 glass, and the optical effects of the pressure load and thermal environment are discussed. A 150 cm diameter free window is feasible using BK7. For a maximum bending stress not exceeding 125 kp/sq cm, thickness should be greater than 7.7 cm. Active temperature control of the cell is required to overcome thermal nonuniformities between center and rim and to eliminate birefringence due to thermally induced stress. If multiwindow apertures are used, temperature within the assembly must be constant within 0.1K in the coherent case. The wedge angle of the elements should equal twice the resolution angle for incoherent use. The thickness should equal 0.2 lambda, the amount corresponding to a constant wedge angle for a coherent case window. Author (ESA)

N82-32221# Freiburg Univ. (West Germany). Kiepenheuer-Inst. fuer Sonnenphysik.

VACUUM AND WINDOW WITH RIM AND CENTER SUPPORT

J. P. Mehltretter *In* Oslo Univ. LEST: Large European Solar

Telescope 30 Apr. 1982 p 205-208 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

Expressions for the bending stresses of a telescope window with a small additionally supported central area are presented. Expressions for maximum bending elongation are taken from the literature, and those for radial and tangential stresses are deduced from the bending moments for given distances from the plate center. Analysis shows that where the central bending excursion is zero, very high stresses equal to those in a window which is not centrally supported occur at the central support. Overall stress can be reduced by choosing the support pressure inside the central area so that radial stress vanishes at the outer boundary of the central support. Along the rim, a hydraulic support system consisting of two concentric O-shaped rings is suggested. For the central support, a frictionless hydraulic piston and an O-ring sealed support plate are advocated. Author (ESA)

N82-32222# Freiburg Univ. (West Germany). Kiepenheuer-Inst. fuer Sonnenphysik.
ON SOME QUASI-CONCENTRIC OPTICAL SYSTEMS FOR THE LARGE-EUROPEAN SOLAR TELESCOPE (LEST)
J. P. Mehltretter *In* Oslo Univ. LEST: Large European Solar Telescope 30 Apr. 1982 p 209-221 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

The large European solar telescope specifications (2.5 m aperture, no image rotation in the final focal plane, minimum of optical surfaces and instrument polarization) are discussed, and the merits of various systems (coaxial, skewed) are compared. A positive skew array of two mirrors (Schiefspiegler system) is ruled out because the highly inclined focal planes mean that the useful field is too small, and considerable focusing is required. Compact Cassegrain or Gregory systems in front of a coelostat system also have field of view limitations. Heliostat systems, using a single long focus primary mirror are advocated. Author (ESA)

N82-32223# Observatoire du Pic-du-Midi (France).
SOME IDEAS FOR A LARGE EUROPEAN SOLAR TELESCOPE (LEST)
Jean Roesch *In* Oslo Univ. LEST: Large European Solar Telescope 30 Apr. 1982 p 222-228 refs Sponsored in cooperation with Observatoire de Toulouse (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

Dome and tube effects, instrument mount, and optics of solar telescopes are discussed, and a Gregory system is advocated for LEST. The advantages of a helium filled tube, and of a closed dome are stressed. An alt-azimuth mount is suggested. The disadvantages of active optics are pointed out. The system proposed has a composite entrance pupil formed by six circular 80 cm, apertures centered on the apexes of a hexagon, and tangent to each other. If turbulence is a problem, interferometry, using two or more of the pupils, can be applied in order to retrieve higher spatial frequencies, or the beams can be directed onto six different auxiliary instruments. Author (ESA)

N82-32224# Freiburg Univ. (West Germany). Kiepenheuer-Inst. fuer Sonnenphysick.
REIMAGING SYSTEMS FOR USE WITH THE PROPOSED RITCHEY-CHRETIEN MAIN TELESCOPE
J. P. Mehltretter *In* Oslo Univ. LEST: Large European Solar Telescope 30 Apr. 1982 p 240-246 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

A convex-concave Cassegrain system, and an apochromatic triplet lens system (S-shaped color curve) are discussed for the large European solar telescope secondary magnification set up. A magnification ratio between 7 and 10 of the F7 primary focal plane is required. The second focus is placed below the coelostat, and the total length between the primary focus and the coelostat entrance is 300 mm. Although the quasi-Cassegrain and triplet lens systems are theoretically feasible, practical implementation is extremely difficult because of alignment problems arising from narrow tolerances. An increase of the focal ratio of the primary focus, to, e.g., F15, and increasing the space between the main telescope and coelostat are suggested. Author (ESA)

N82-32225# Freiburg Univ. (West Germany). Kiepenheuer-Inst. fuer Sonnenphysik.
ALIGNMENT TOLERANCES OF THE PROPOSED RITCHEY-CHRETIEN SYSTEM, AND INTERFEROMETRIC CONTROL OF ITS ALIGNMENT
J. P. Mehltretter *In* Oslo Univ. LEST: Large European Solar Satellite 30 Apr. 1982 p 246-253 (For primary document see N82-32209 22-89)
Avail: NTIS HC A12/MF A01

Numerical data on LEST alignment tolerances (deformation constants, inclination of primary mirror axis with respect to system axis, inclination of secondary mirror axis, lateral and axial shift of secondary) are given. The alignment system has to provide both inclination and lateral shift of the secondary with respect to the primary and its axis. Tolerances are such, e.g., 15 microns lateral shift, that passive systems cannot assure alignment. A system which places four interferometers in the primary and secondary mirror holes, and uses a zero order white fringe for displacement and tilt detection is proposed. An inclination of the primary can be treated as a lateral shift and tilt of the secondary. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-32226# Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study.
COSMOLOGICAL ORIGIN OF MASS SCALES
Hidezumi Terazawa Feb. 1981 17 p refs
(DE82-700129; INS-400) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The possibility that spontaneous breakdown of conformal invariance due to the very existence of our universe originates all the mass (or length) scales ranging from the Planck mass (approx. 10 to the 19th power GeV) to the Hubble constant (approx. 10 to the -42nd power GeV). It is suggested that the photon may have a curvature-dependent mass which is as small as 10 to the -42nd power GeV. Also, a possible clue to the Dirac's large number hypothesis is presented. DOE

N82-32227*# Lund Observatory (Sweden).
SCATTERING BY ENSEMBLES OF SMALL PARTICLES EXPERIMENT, THEORY AND APPLICATION
Bo Aa. S. Gustafson 1980 130 p refs Sponsored in part by Uppsala Univ., The Royal Swedish Academy of Sciences, and Lund Univ.
(Contract NsG-7093)
(NASA-CR-169219; NAS 1.26:169219; DE81-700760; LUNFD6/NFAS-0017; ISSN-0349-4217) Avail: NTIS HC A07/MF A01 CSCL 03B

A hypothetical self consistent picture of evolution of prestellar intertellar dust through a comet phase leads to predictions about the composition of the circum-solar dust cloud. Scattering properties of thus resulting conglomerates with a bird's-nest type of structure are investigated using a micro-wave analogue technique. Approximate theoretical methods of general interest are developed which compared favorably with the experimental results. The principal features of scattering of visible radiation by zodiacal light particles are reasonably reproduced. A component which is suggestive of (ALPHA)-meteoroids is also predicted. DOE

N82-32228# Paris XI Univ., Orsay (France).
A MEAN FIELD CALCULATION OF THE EQUATION OF STATE OF SUPERNOVA MATTER
P. Bonche Dec. 1980 67 p refs

(DE81-700829; IPNO-TH-80-66) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The equation of state for hot dense matter occurring in stellar collapse is calculated using the Hartree-Fock approximation at finite temperature. The effective nucleon-nucleon interaction is a modified Skyrme force which gives a rather good value of the compression modulus in nuclear matter. Results are presented for the adiabat S=1 per baryon, with a fixed value of the electron fraction Y sub e = 0.25, in the density range rho = 0.02 to 0.07 baryons per fm(3). It is found that nuclei are still present in the medium. As a consequence the adiabatic index is slightly less than 4/3. The presence of a transition, around half nuclear matter density, towards a phase made of bubbles is also discussed. DOE

N82-32229*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THERMONUCLEAR RUNAWAYS IN THICK HYDROGEN RICH ENVELOPES OF NEUTRON STARS

Sumner G. Starrfield (Arizona State Univ., Tempe), S. Kenyon (Illinois Univ., Urbana), J. W. Truran (Illinois Univ., Urbana), and W. M. Sparks 1981 8 p refs Presented at the Workshop on Gamma Ray Transients and Related Astrophys. Phenomena, La Jolla, Calif., 5 Aug. 1981 Prepared in cooperation with LASL, N. Mex. Submitted for publication

(Contract W-7405-eng-36)

(NASA-TM-84713; NAS 1.15:84713; DE82-000582; LA-UR-81-2684; CONF-810871-4) Avail: NTIS HC A02/MF A01 CSCL 03B

A Lagrangian, fully implicit, one dimensional hydrodynamic computer code was used to evolve thermonuclear runaways in the accreted hydrogen rich envelopes of 1.0 Msub solar neutron stars with radii of 10 km and 20 km. Simulations produce outbursts which last from about 750 seconds to about one week. Peak effective temeratures and luninosities were 26 million K and 80 thousand Lsub solar for the 10 km study and 5.3 millison and 600 Lsub solar for the 20 km study. Hydrodynamic expansion on the 10 km neutron star produced a precursor lasting about one ten thousandth seconds. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N82-32230# Smithsonian Astrophysical Observatory, Cambridge, Mass.

CATALOG OF METEORITES FROM VICTORIA LAND, ANTARCTICA, 1978 - 1980

Ursula B. Marvin, ed. and Brian Mason, ed. 1982 102 p refs (Pub-24) Avail: NTIS HC A06/MF A01

Meteorite specimens collected on expeditions to Victoria Land are described. Classifications are given for all specimens weighing more than about 100 grams and also for some smaller pieces from each of the four field seasons. The field camps, the geodetic measurements of ice motion and ablation at the Allan Hills site, and the search for concentrations are described. Information about the character of the collections and new types of meteorites represented in them is outlined and Antarctic achondrites, carbonaceous chondrites and irons, and meteorite weathering and terrestrial residence times on the pol icecap are also described. For individual titles, see N82-32231 through N82-32240.

N82-32231# Smithsonian Astrophysical Observatory, Cambridge, Mass.

THE FIELD SEASON IN VICTORIA LAND, 1978 - 1979

Ursula B. Marvin *In its* Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 3-8 (For primary document see N82-32230 22-91)

Avail: NTIS HC A06/MF A01

Areas near the head of the Darwin Glacier were searched for meteorite concentrations, a geodetic network to measure ice motion and ablation at the Allan Hills was layed out, and a systematic collection of specimens in the Allan Hills icefield was continued. Five specimens were found in the upland between the head of the Darwin Glacier and that of the Hatherton Glacier. Twenty-three specimens, most of them small and weathered to a chestnut brown, were collected from ripple indentations on a rather steeply sloping, bare ice surface near the west end of the Darwin Mountains. Their similar appearance and their distribution over an open slope suggested that they represented a relatively recent strewnfield from atmospheric breakup of a single meteorite. S.L.

N82-32232# Pittsburg Univ., Pa. Dept. of Geology and Planetary Science.

THE TRAVERSE TO RECKLING PEAK, 1979 - 1980

W. A. Cassidy and L. A. Rancitelli (Battelle Memorial Inst.) *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 9-11 (For primary document see N82-32230 22-91)

Avail: NTIS HC A06/MF A01 CSCL 03B

Meteorites were concentrated in at least two locations along this linear ice field. They are associated with moraine deposits on the lower level of the ice step, but apparently are not found in such great numbers at Reckling Peak as at the Allan Hills site. The Allan Hills outcrop penetrates the ice and forms an absolute barrier to further ice flow downstream from the monocline. There is no such barrier at the Reckling Peak ice field. This may help explain the lower abundances of meteorites exposed at the latter site. Meteorite concentrations have higher surface density when associated with moraines they do elsewhere along the length of an ice field, because the bedrock barrier is closer to the surface at those locations and the ice may be flowing more slowly there. S.L.

N82-32233*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE ALLAN HILLS ICEFIELD AND ITS RELATIONSHIP TO METEORITE CONCENTRATION

John O. Annexstad *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 12-18 (For primary document see N82-32230 22-91)

Avail: NTIS HC A06/MF A01 CSCL 03B

The Allan Hills icefield is described by as a limited icefield that has large concentrations of meteorites. The meteorites appear to be concentrated on the loer limb of an ice monocline with other finds scattered throughout the field. In an attempt to understand the mechanisms of meteorite concentration, a triangulation chain was established across the icefield. This chain is composed of 20 stations, two of which are on bedrock, and extends westward from the Allan Hills a distance of 15 kilometers. The triangulation chain and its relationship to the meteorite concentrations is shown. S.L.

N82-32234*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DESCRIPTIONS OF STONY METEORITES

Roberta Score, Trude V. V. King, Carol M. Schwarz, Arch M. Reid (Cape Town Univ.), and Brian Mason (Smithsonian Institution) *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 19-48 (For primary document see N82-32230 22-91)

Avail: NTIS HC A06/MF A01 CSCL 03B

The individual specimens, arranged by class are described. Within the chondrites, the specimens are grouped according to the Van Schmus-Wood classification, and the descriptions follow the order of increasing petrographic type. The original weight of the specimen is given to the nearest gram (nearest 0.1 gram for specimens weighing less than 100 grams). Material on al characterized meteorites collected together with descriptions of some meteorites is included. Specimens weighing less than 100 grams are listed without descriptions, unless they show distinctive features. S.L.

N82-32235# National Museum of Natural History, Washington, D. C. Dept. of Mineral Sciences.
DESCRIPTIONS OF IRON METEORITES
Roy S. Clarke, Jr. *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 49-56 (For primary document see N82-32230 22-91)
Avail: NTIS HC A06/MF A01

The 19 iron meteorite specimens that were collected in Victoria land are described. Their textural and chemical properties indicate that five irons from the Allan Hills derive from a single shower as do nine from Derrick Peak. Descriptions of specimens are given in the order of their chemical classification groups. Specimens grouped as members of a single fall are listed by the lowest numbered specimen retained in United States collection. S.L.

N82-32236# National Museum of Natural History, Washington, D. C. Dept. of Mineral Sciences.
OVERVIEW OF ANTARCTIC IRONS
Roy S. Clarke, Jr. *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 57-58 (For primary document see N82-32230 22-91)
Avail: NTIS HC A06/MF A01

Antarctica has enriched meteorite collections in recent years by providing specimens from 10 different iron meteorite falls representing six structural classes. A total of 22 individual specimens were reported. The meteorites are listed with their structural and chemical classifications in the order of their date of recovery. S.L.

N82-32237# Cape Town Univ. (South Africa). Dept. of Geology.
OVERVIEW OF ANTARCTIC ACHONDRITES
Arch M. Reid *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 59-64 (For primary document see N82-32230 22-91)
Avail: NTIS HC A06/MF A01

The distribution of achondrite classes in the Antarctic and non-Antarctic collections are compared. The numbers in the non-Antarctic column are an unreliable guide to the real distribution of achondrite types in the total terrestrial infall because of the vagaries of observation, recognition, and recovery. The Antarctic meteorites provide a better guide since they are more easily recognized and are all carefully studied and cataloged. There remarked differences between the Antarctic and non-Antarctic achondrite collections. Diogenites are more abundant inthe Antarctic collection, comprising over half the classified samples. S.L.

N82-32238# Arizona State Univ., Tempe. Center for meteorite Studies.
OVERVIEW OF ANTARCTIC CARBONACEOUS CHONDRITES
Carleton B. Moore *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 65-66 (For primary document see N82-32230 22-91)
Avail: NTIS HC A06/MF A01

Seven carbonaceous chondrite specimens were collected from the Yamato Mountains and three from the Allan Hills region of Antarctica. Of the approximately 3000 meteorites collected additional 20 uncharacterized, small, carbonaceous, chondrite pieces were recovered. This relatively low yield compared to the large number of ordinary chondrites recovered leads to speculation that in Antarctica there are processes that act against the recovery of this interesting meteorite type. The possibility that the recovered carbonaceous chondrites fell near their recovery sites and were not transported long distances by moving ice may ultimately be tested by measurements of their terrestrial residence times. S.L.

N82-32239# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
WEATHERING EFFECTS IN ANTARCTIC METEORITES
Michael E. Lipschutz *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 67-69 refs (For primary document see N82-32230 22-91)
(Grant NGL-15-005-140)
Avail: NTIS HC A06/MF A01 CSCL 03B

Chemical data bearing upon effects of chemical alteration by weathering of Antarctic stony and stony iron meteorites are reviewed. In more temperature regions, weathering effects in meteoritic finds generally involve contamination usually to such an extent that trace element data of finds are viewed very suspiciously. Conditions in Antarctica are sufficiently different that the principal weathering effect in meteoritic finds there is element loss by leaching; contamination, however, is observed for some elements. Different elements in the same meteorite can respond differently to weathering; thus, absence of a weathering effect for one element need not mean that another will be unaffected. S.L.

N82-32240# Battelle Pacific Northwest Labs., Richland, Wash.
ALUMINUM-26: SURVEY OF VICTORIA LAND METEORITES
J. C. Evans, J. H. Reeves, and L. A. Rancitelli *In* Smithsonian Astrophysical Observatory Catalog of Meteorites from Victoria Land, Antarctica, 1978 - 1980 1982 p 70-74 (For primary document see N82-32230 22-91)
Avail: NTIS HC A06/MF A01

The Al-26 content of Victoria Land meteorites was studied out by nondestructive gamma ray analysis. A total of 104 samples from the Victoria Land region were studied. Most of the samples were ordinary chondrites from the Allan Hills region. Terrestrial ages for meteorites recovered from the Antarctic ice sheet are established. This information is used to infer information on long term movement of the ice sheet, as well as helping to provide an understanding of the accumulation mechanism for meteorites at specific sites. Terrestrial residence times can, in principle, be derived from a measurement of the decay of a cosmic ray produced isotope from its saturation level in space. S.L.

N82-32241# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A THREE DIMENSIONAL MODEL OF THE PLASMA FLOW AND MAGNETIC FIELDS IN THE DAYSIDE IONOSPHERE OF VENUS Ph.D. Thesis
Thomas F. Tascione Mar. 1982 173 p refs
(AD-A116692; AFIT/NR-82-16D) Avail: NTIS HC A08/MF A01 CSCL 20/9

Today, the Earth's instrinsic magnetic field prevents the streaming solar wind plasma from directly interacting with the terrestrial atmosphere. Periodically the geomagnetic field reverses direction, and during the transition period, the Earth's magnetic barrier is thought to disappear. In the past, studies about the atmospheric-solar wind interaction dynamics were hindered by a scarcity of observational data. However, since December 1978, the Pioneer-Venus Orbiter has been providing daily observations of the atmospheric dynamics produced by the direct solar wind interaction with the atmosphere of Venus (the only planet known to lack an intrinsic magnetic field). This thesis develops the first three dimensional magnetohydrodynamic (MHD) theory of this interaction. Within the ionosphere of Venus analytic solutions to the MHD equations are possible because of a favorable geometry between the induced ionospheric magnetic fields and the ionospheric plasma motions. It is shown that variations in the solar wind speed and interplanetary magnetic vedtor direction cause variations in the dayside ionospheric plasma flows and the induced magnetic field configuration, and that these changes can account for the variety of magnetic structures observed by Pioneer-Venus. Portions of the Venus ionosphere are shown to be susceptible to the Kelvin-Helmholtz shear instability. The unusual shape of the computed region of stability is shown to be an important key to understanding the highly variable Pioneer-Venus observations. Model calculations are compared to observations for a number of selected orbits, and the model is shown to match the observations in fine detail. GRA

N82-32280# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON FIRST RESULTS FROM VENERA-13 AND VENERA-14
R. SAgdeyev and V. Moroz *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 25-29 Transl. into ENGLISH

from Pravda (USSR), 12 Mar. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

N82-32281# Joint Publications Research Service, Arlington, Va.
VENERA MASS SPECTROMETER DATA ON ATMOSPHERIC COMPOSITION
V. Istomin *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 30-33 Transl. into ENGLISH from Pravda (USSR), 21 Apr. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-32242# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering.
ANISOTROPY OF SOLAR RADIATION LEAVING THE EARTH-ATMOSPHERE SYSTEM Ph.D. Thesis
John Timothy Suttles May 1981 215 p refs
Avail: NTIS HC A10/MF A01

The anisotropic nature of solar radiation leaving the Earth atmosphere system is investigated. The problem of the transfer of solar radiation in the Earth atmosphere system is solved using an appropriate numerical solution technique and solutions are compared with measurements of upwelling radiance from available satellite data. The numerical solution technique used is based on an existing finite difference method which is extended to include azimuthal variations, spectral variations for the entire solar wavelength range, and specular as well as diffuse reflection at the surface. The Earth atmosphere system is approximated locally as a plane parallel layer with detailed vertical profiles of the physical and optical properties of the important atmospheric gases and aerosols. The cloudy atmosphere is approximated by a plane parallel, homogeneous layer. S.L.

N82-32243*# Stanford Univ., Calif. Inst. for Plasma Research.
CORRELATION OF HARD X-RAY AND TYPE 3 BURSTS IN SOLAR FLARES
Vahe Petrosian and John Leach [1982] 27 p refs
(Grant NsG-7092)
(NASA-CR-169167; NAS 1.26:169167) Avail: NTIS HC A03/MF A01 CSCL 03B

Correlations between X-ray and type 3 radio emission of solar bursts are described through a bivariate distribution function. Procedures for determining the form of this distribution are described. A model is constructed to explain the correlation between the X-ray spectral index and the ratio of X-ray to radio intensities. Implications of the model are discussed. S.L.

N82-32244*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
CALCULATION OF SOLAR WIND FLOWS ABOUT TERRESTRIAL PLANETS Contractor Report, Jul. 1978 - Dec. 1981
Stephen S. Stahara and John R. Spreiter Aug. 1982 43 p refs
(Contract NASw-3184)
(NASA-CR-169274; NAS 1.26:169274; NEAR-TR-262) Avail: NTIS HC A03/MF A01 CSCL 03B

A computational model was developed for the determination of the plasma and magnetic field properties of the global interaction of the solar wind with terrestrial planetary magneto/ionospheres. The theoretical method is based on an established single fluid, steady, dissipationless, magnetohydrodynamic continuum model, and is appropriate for the calculation of supersonic, super Alfvenic solar wind flow past terrestrial planets. A summary is provided of the important research results. B.W.

N82-32245# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INTERACTION OF THE SOLAR WIND WITH COMETARY IONOSPHERES M.S. Thesis [INTERACAO DO VENTO SOLAR COM A INOSFERA DE COMETAS]
Samuel deSouza Jan. 1982 105 p refs In PORTUGUESE
(INPE-2311-TDL/075) Avail: NTIS HC A06/MF A01

The interaction of the solar wind with the comet's ionosphere is studied. Exact solutions for the number density of the neutral particles outgassing from the comets nucleus, in the presence of the solar radiation pressure, are obtained. This kind of information is extremely important in the formation of the shock wave and tangential discontinuity, on the sunside of the comet, after the neutrals become ionized. Solutions of the conservation equation of the number density, mass, momentum and energy, are also obtained. S.L.

N82-32246# Bern Univ. (Switzerland). Div. of Solar Observations.
SOLAR DATA, JANUARY - JUNE 1982 Annual Report, Jan. - Jun. 1982
M. Fuhrer, N. Kaempfer, A. Magun, W. Schoechlin, M. Staehli, and J.-P. Wuelser Jul. 1982 35 p
(Rept-48) Avail: NTIS HC A03/MF A01

Standard measurements of solar activity carried out at the solar observatory are presented. The measurements show start, maximum, duration, peak flux, and circular polarization at peak as percentage, of outstanding events. Author (ESA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-32247 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
PROJECTION ON THE GALAXY ANTICENTER IN THE LIGHT OF MeV-GAMMA RADIATION AND THE SEARCH FOR GAMMA EMISSION FROM RADIOPULSARS [ABBILDUNG DES ANTIZENTRUMS DER GALAXIE IM LICHTE VON MeV - GAMMA STRAHLUNG UND SUCHE NACH GAMMA EMISSION VON RADIOPULSAREN]
Uwe Graser Feb. 1982 162 p refs In GERMAN
(MPI-PAE/Extraterr-174; ISSN-0340-8922) Avail: Issuing Activity

Two compton telescope carrying balloon flights for the measurement of cosmic MeV-gamma radiation and gamma emission from radiopulsars, are reported on. A clearly enhanced gamma emission is observed in the galactic length domain between 160 and 197 deg arc and is partially due to the Crab nebula plus pulsar. Electron Bremsstrahlung is mainly responsible for MeV-gamma quanta from the anticentrum direction. The electron spectrum bends at about 30 MeV. The low energy gamma domain is determined with a significance of 6.5 sigma. Pulses in the gamma and the Rontgen domain are in phase. The measured light curve of the 0950 + 08 pulsar shows two maxima and has the same profile as the gamma pulsars Crab and Vela. Author (ESA)

N82-32248# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TERRESTRIAL ELECTROMAGNETIC INDUCTION BY WAY OF THE Sq (DIURNAL SOLAR VARIATION) IN THE REGION OF THE EQUATORIAL ELECTROJET [INDUCAO ELETROMAGNETICA TERRESTRE ATRAVES DE SQ NA REGIAO DO ELETROJATO EQUATORIAL]
Nalin Babylal Trivedi and Elesbao Grigorio deSouza Mar. 1982 13 p refs In PORTUGUESE
(INPE-2354-RPE/408) Avail: NTIS HC A02/MF A01

Magnetotelluric measurements conducted continuously at Eusebio (3.870 S, 321.58 deg E) during the period 1979 to 1980 are used for electromagnetic induction studies. It is shown that

the Sq diurnal variation in the region of equatorial electrojet does not have the internal component of induction. The analysis of Eusebio data demonstrated that the diurnal variation in the equatorial electrojet region consists of both internal and external components. These results are presented and discussed. Author

99 GENERAL

N82-32249# Office of Science and Technology, Washington, D.C.
SCIENCE AND TECHNOLOGY REPORT TO THE CONGRESS: 1981 Annual Report
21 Apr. 1982 174 p Prepared in Cooperation with NSF
(STAR-4) Avail: NTIS HC A08/MF A01

Progress in science and technology in 1981 is reported. Decisions regarding science and technology policy making are discussed. Federal research and development programs are reviewed. The research and development section of the United States Government Budget for 1983 is analyzed. R.J.F.

N82-32250# Department of Energy, Washington, D. C. Office of Energy Research.
SUMMARIES OF FY 1981 ENGINEERING RESEARCH
Feb. 1982 45 p
(DE82-008344; DOE/ER-0121) Avail: NTIS HC A03/MF A01

This report documents the Basic Energy Sciences (BES) Engineering Research program for fiscal year 1981; it provides a summary for each of the 39 program projects in addition to a brief program overview. The report is intended to provide staff of congressional committees, other executive departments, and other DOE offices with substantive program information so as to facilitate governmental overview and coordination of federal research programs. Of equal importance, its availability facilitates communication of program information to interested research engineers and scientists. DOE

N82-32251# Royal Norwegian Council for Scientific and Industrial Research, Oslo. Space Activity Div.
SPACE ACTIVITY IN NORWAY Annual Report, 1981
Arne Gundersen, Jan A. Holtet, and Ann-Lisbeth Ruud Mar. 1982 56 p refs Presented to 24th COSPAR Plenary Meeting, Ottawa, 17 May-3 Jun. 1982 Original contains color illustrations
(SAD-97-T; ISSN-82-7224-172-2) Avail: NTIS HC A04

Norwegian research in space physics, astrophysics, and life science is summarized. Participation in ESA remote sensing, satellite navigation and communication, SAR data processing and maritime search and rescue projects is outlined. Applications of satellite systems in oceanographic, geographic, geological, and meteorological research are described. Author (ESA)

N82-32252# Royal Society, London (England). British National Committee on Space Research.
UNITED KINGDOM REPORT ON SPACE RESEARCH Annual Report, 1980-1981
1982 50 p refs Presented at 24th COSPAR Plenary Meeting, Ottawa, 17 May-3 Jun. 1982
Avail: NTIS HC A03/MF A01

British university and research institute involvement in European and NASA space programs is described. Astronomy, remote sensing, atmospheric investigation, and orbit determination projects are summarized. Author (ESA)

N82-32253# Austrian Solar and Space Agency, Vienna.
SPACE ACTIVITY IN AUSTRIA Annual Report, 1980/81
Ferdinand Steinhauser and E. Mondre, ed. Jun. 1981 23 p refs Presented at 24th COSPAR Plenary Meeting, Ottawa, 17 May-3 Jun. 1982
Avail: NTIS HC A02/MF A01

Austrian participation in the ESA Spacelab program and telecommunications projects is summarized. Remote sensing activities, atmosphere investigations (ionospheric electron content, magnetopause shape studies), and satellite meteorology, astronomy, and geology programs are described. Author (ESA)

N82-32254# Danish Academy of Technical Sciences, Copenhagen.
SPACE RESEARCH IN DENMARK Annual Report, 1980-1981
1982 12 p refs Presented at 24th COSPAR Plenary Meeting, Ottawa, 17 May-2 Jun. 1982
Avail: NTIS HC A02/MF A01

Danish participation in ESA programs, and research in astrophysics, X-ray astronomy, geophysics, plasmas, and geodesy are summarized. High energy cosmic rays, the Earth's magnetic field auroras, particle precipitation, analog weather images, and the Earth's gravity field were studied. Author (ESA)

N82-32255# Swedish Board for Space Activities, Stockholm.
SPACE RESEARCH IN SWEDEN Annual Report, 1981
K. Fredga, ed. 1982 48 p refs Presented at 24th COSPAR Plenary Meeting, Ottawa, 17 May-2 Jun. 1982
Avail: NTIS HC A03/MF A01

Swedish participation in ESA programs, and research in magnetospheric and ionospheric physics, astrophysics, meteorology, astrophysics, material sciences, and remote sensing are summarized. Charged particles and atmospheric electric and magnetic fields were measured. Solar and stellar UV radiation were studied. Metal solidification in zero gravity and diffusion in liquid metals were investigated. Author (ESA)

N82-32256# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
RAMJETS AND RAMROCKETS FOR MILITARY APPLICATIONS
Mar. 1982 266 p refs Mostly in ENGLISH; One in FRENCH Proceedings of 58th Propulsion and Engergetics Symp., London, 26-29 Oct. 1981
(AGARD-CP-307; ISBN-92-835-0312-X) Avail: NTIS HC A12/MF A01

A comprehensive survey of ramjet and ramrocket technology and its application to missile propulsion is presented. For individual titles, see N82-32257 through N82-32274.

N82-32257# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
LOW-COST COMBUSTOR FOR A SUPERSONIC TACTICAL MISSILE c20
T. D. Myers and A. P. Peters *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 15 p (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Development of a low cost advanced low volume ramjet (ALVRJ) propulsion system for the supersonic tactical missile (STM) and other tactical mission applications is summarized. A series of propulsion system performance/cost vehicle systems trades were conducted. Key propulsion system requirements that most strongly influenced cost were: (1) fuel flow rate accuracy, (2) inlet pressure recovery, and (3) required combustor operational life. From these trade studies specific low cost ramjet component designs were selected, including: (1) inlet, (2) fuel controller, (3) rocket booster motor nozzle release mechanism, and (4) combustor/thermal protection system (TPS). The low cost combustor/TPS development effort is stressed. The low cost combustor for the STM propulsion system was successfully demonstrated through a series of ground tests and a flight test. The 5:1 combustor cost reduction for the STM propulsion system compared to the ALVRJ propulsion sytem was achieved with no performance penalty. J.D.

N82-32258# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
ENGINE SIZING AND INTEGRATION REQUIREMENTS FOR HYPERSONIC AIRBREATHING MISSILE APPLICATIONS c15
Paul J. Waltrup, Frederick S. Billig, and Richard D. Stockbridge *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982

41 p refs (For primary document see N82-32256 22-99)
(Contract N00024-81-C-5301)
Avail: NTIS HC A12/MF A01

A procedure that provides a rational means for selecting an inlet/combustor configuration for a hypersonic airbreathing missile is presented. The particular problem that is addressed is the design of the sustained engine of a two stage missile that is constrained to be launched from a stowage volume that is either square or circular in cross section. The sustainer engine accelerates from a low altitude separation at Mach 4 and climbs to high altitude for cruise at Mach 8. The results show that a missile with an axisymmetric nose inlet provides a somewhat higher thrust capability and slightly better fuel efficiency than a chin type inlet. Aft entry inlets are shown to have a substantially lower thrust potential and lower engine efficiency. A criterion for determining the maximum contraction ratio of a fixed geometry inlet is established and applied to the exemplary missile designs. Combustor area ratio is examined and found to have a relatively small effect on engine performance for area ratios equal to or larger than that required to obtain maximum thrust at the take-over Mach number. Author

N82-32259# Stuttgart Univ. (West Germany). Inst. fuer Raumfahrtantriebe.
DESIGN CONSIDERATION AND ANALYTICAL COMPARISON OF DIFFERENT TYPES OF RAMJETS AND RAMROCKETS **c20**
Peter Benkmann and Peter A. Kramer *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 14 p refs Sponsored in part by the German Ministry of Defense (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Several types of ramjet and ramrocket (or ducted rocket) propulsion systems with hydrocarbon fuels for high sub- to supersonic missile application are theoretically analyzed and compared. Design considerations are discussed with respect to their performance impacts. Fundamental physical connections as well as mission and internal design variables are investigated in order to give some insight into the ramjet's and ramrocket's performance and application potential. The results are presented in graphical form. Author

N82-32260# Calgary Univ. (Alberta). Dept. of Mechanical Engineering.
VALVELESS PULSEJETS AND ALLIED DEVICES FOR LOW THRUST, SUBSONIC, PROPULSION APPLICATIONS **c20**
J. A. C. Kentfield *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 11 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

A review is presented of predicted flight performances, based on well established static test stand data, of current technology valveless pulsejets. Comparisons are made with alternative forms of propulsion suitable for small subsonic vehicles. It is shown that valveless pulsejets have some performance advantages over other forms of propulsion for short-range missions requiring low thrust levels of less than about 600 Newtons (approximately less than 130 lb sub f). The advantages of valveless pulsejets in terms of simplicity when compared with other propulsion systems are also shown to be substantial. Possible ways of improving pulsejet performance are discussed. The systems considered involve means for obtaining improved precombustion charge compression using twin alternately firing pulsed combustors and more sophisticated units incorporating dynamic pressure-exchangers. Author

N82-32261# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
MULTIPLE INTAKES FOR RAMROCKETS **c15**
E.-O. Krohn and K. Triesch *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 14 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Several ramrocket missiles under development have a central combustion chamber and more than one side mounted intake in general four. The junction of different inlet flows in a common chamber causes, in certain cases, flow instability and flow reversal in single ducts. The flow mechanism will be explained by examples. A computer program was developed which calculates the overall performance of the system from single inlet data. The results are compared with wind tunnel measurements. Methods for reducing the negative effects of combining multiple intakes with a common chamber are discussed. Author

N82-32262# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ONE-DIMENSIONAL NONLINEAR CONSIDERATIONS ON SUPERSONIC DIFFUSER BUZZ **c02**
Hermann-L. Weinreich *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 14 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

The fundamental aspects of supersonic intake buzz are discussed. The basic characteristics of the phenomenon are described and its relationship to other unsteady propulsion processes presented. A simplified intake propulsion stability analysis shows the possible influence of diffuser exit Mach number on the stability boundary in comparison to other well-known theories. Nonlinear example calculations using smooth intake pressure recovery curves can illustrate some experimentally observed buzz characteristics. The limits of the theoretical approach are discussed, and the tendencies compared with experimental work. Author

N82-32263# Stuttgart Univ. (West Germany). Inst. fuer Raumfahrtantriebe.
RANGE MAXIMIZATION METHOD FOR RAMJET POWERED MISSILES WITH FLIGHT PATH CONSTRAINTS **c15**
Ulrich M. Schoettle *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 19 p refs Sponsored in part by the German Ministry of Defense (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Mission performance of ramjet powered missiles is strongly infuenced by the trajectory flown. The trajectory optimization problem considered is to obtain the control time histories (i.e., propellant flow rate and angle of attack) which maximize the range of ramjet powered supersonic missiles with preset initial and terminal fight conditions and operational constraints. The approach chosen employs a parametric control model to represent the infinite-dimensional controls by a finite set of parameters. The resulting suboptimal parameter optimization problem is solved by means of nonlinear programming methods. Operational constraints on the state variables are treated by the method of penalty functions. The presented method and numerical results refer to a fixed geometry solid fuel integral rocket ramjet missile for air-to-surface or surface-to-surface missions. The numerical results demonstrate that continuous throttle capabilities increase range performance by about 5 to 11 percent when compared to more conventional throttle control. Author

N82-32264# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
JET-AFTERBODY INTERFERENCE ON MISSILES IN SUPERSONIC FLOW **c02**
Bernhard Wagner *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 11 p refs Sponsored in part by the German Ministry of Defense (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Axisymmetric base flow in the presence of an exhaust jet is investigated, taking into account essential physical parameters. Using the method of characteristics for the inviscid flow regions and Korst's treatment for the turbulent shear layers, the influence of the approaching boundary layers is introduced by the concepts of equivalent bleed and origin shift, and the ONERA angular criterion is used for the recompression process. With respect to the interferences in the confluence problem of internal and external

shear layers special attention is given to the momentum terms in the ONERA criterion and a modification is performed in order to achieve agreement of both reattachment pressures at the confluence point. The investigations include separation from conical boattails by applying a simple separation criterion and extend to small angles of attack by computing the inviscid flow with the aid of a linearized characteristics method. For the axisymmetric case a first result is provided from numerical solutions of the full Navier-Stokes equations. Author

N82-32265# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
BASE AND EXTERNAL BURNING FOR PROPULSION c25
Warren C. Strahle and James E. Hubbartt *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 9 p refs (For primary document see N82-32256 22-99)
(Contract FA9620-78-C-0003)
Avail: NTIS HC A12/MF A01

Experimental studies of base and external burning behind an axisymmetric bluff base body in Mach 3 flight are described. Pure hydrogen and hydrogen diluted with CO2 He and N2 were the fuels. A variety of base configurations were used and external burning used radial jet injection with both subsonic and supersonic jets. Some wind tunnel interference problems arose which limited consideration of the results to base pressure elevation to free stream static pressure. A maximum performance condition was identified as a line in 1 sub SP - base pressure rise space which was achievable with all configurations and combinations of base and external burning. The major determinant of 1 sub SP performance is the total heat dump rate into the wake, and only minor differences in performance result from configuration and fuel type details. Author

N82-32266# Rolls-Royce Ltd., Bristol (England).
SERVICE EXPERIENCE WITH THREE GENERATIONS OF RAMJETS c20
C. F. Fletcher and D. R. Lane *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 9 p (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

The development of three generations of ramjets for use in operational surface to air missiles is discussed. Operation and maintenance in tropical, arctic and marine environment was tested. The precautions taken during design to achieve reliability and a low level of mantenance effort are reported. In the third generation, design progressed to the establishment of wooden round status for a factory filled liquid fuelled ramjet. The reliability of the ramjet propulsion system in many practice firings of service maintained missiles by service crews is discussed and compares well with that of rocket systems. E.A.K.

N82-32267# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hardthausen (West Germany). Inst. fuer Chemische Antriebe und Verfahrenstechnik.
EXPERIMENTAL INVESTIGATION OF A HYDROCARBON SOLID FUEL RAMJET c20
Dirk Meinkoehn and Juergen W. Bergmann *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 11 p (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

A solid fuel ramjet motor in a connected pipe air supply under simulated in flight operating conditions was investigated. Diffuser losses based on empirical efficiencies were considered and a set of states of the air upstream of the ramjet combustor was theoretically derived to simulate certain in flight conditions of a ramjet-powered missile. Internal ballistics, combustion efficiency and overall combustor performance which covers a range of Mach numbers between 1.5 and 3.0 for altitudes between sea level are investigated and 6000 m Polyethylene was the hydrocarbon fuel used in most of the tests. It is found that a suitable regression can be established for varying peformance requirements even by providing for trajectory dependent combustion efficiencies. E.A.K.

N82-32268# Naval Weapons Center, China Lake, Calif.
BORON COMBUSTION IN DUCTED ROCKETS c25
Klaus C. Schadow *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1902 12 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

The qualitative effect of inlet and combustor parameter on mixing and overall performance for solid boron propellant gas generator ramjets with two opposing 45 deg side air inlets were studied. Highest combustion efficiencies were achieved at lowest air injection momentum and lowest fuel injection momentum. The decrease of the combustion efficiency with increasing air injection was underlined explaining the observed combustion efficiency decrease with decreasing ramjet combustor pressure and increasing air to fuel ratio, which at constant air inlet geometry results in increasing air injection momentum. It is shown that optimum plume ignition at the fuel injector is more difficult to achieve at decreasing fuel mass flow per fuel injector. The importance of the combustor aerodynamics for achieving efficient boron combustion is shown. E.A.K.

N82-32269# Centre de Recherches du Bouchet, Vert de Petit (France). Direction technique Autopropulsion.
STUDY AND PERFECTION OF A SOLID PROPELLANT FOR RAMJET ENGINES [RECHERCHE ET MISE AU POINT D'UN PROPERGOL SOLIDE POUR STATO-FUSEE] c28
Jd. Berard, G. Doriath, and C. Perut *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 10 p refs In FRENCH (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Gas reductors capable of supplying the fire box of a ramjet can be generated by an oxygenated propellant. By reason of its total discretion, the reserved solution can absorb a small quantity of an organic oxidant in a hydrocarbonated bond. The composition designated 1603 is characterized by its use, and its mechanical and ballistic properties. The reaction of grain size, strength of charge and the nature of the binder on the ballistic parameters are evaluated. Transl. by E.A.K

N82-32270# Pisa Univ. (Italy). 1st. di Macchine.
DESIGN OF HYDROGEN FUELED RAMJETS AND RAMROCKETS c20
Dino Dini *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 5 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Problems arising from high energy fuels, particularly hydrogen which impose remarkable changes in interface components, geometry and control, of current ramjets and ramrockets design are discussed. Starting from typical missions scenarios, advanced configurations are established for military applications. Variable geometry nozzles and combustion chambers because of their combined effect with the intake to give good performance and flexibility are considered. A numerical example of overall design is given for very high flight Mach numbers which considers the problem arising from engine/airframe integration and cryogenic fuel storage. Features effecting installation of such engines in aircraft are examined. E.A.K.

N82-32271# University of Southern California, Los Angeles. Dept. of Mechanical Engineering.
THE ROLE OF LIQUID PHASE DROPLET DECOMPOSITION IN AN ADVANCED AIRBREATHING PROPULSION SYSTEM c25
Melvin Gerstein and P. Roy Choudhury *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 8 p refs (For primary document see N82-32256 22-99)
(Grant AF-AFOSR-3354-77)
Avail: NTIS HC A12/MF A01

The coupled effect of decomposition and evaporation of a typical fuel spray was studied. It is shown that droplet decomposition at higher pressure for both pure and commercial fuel blends significantly influence the combustion efficiency, carbon build-up on the walls of the combustion chamber and the possble formation of pollutants and particulate matter in the exhaust. E.A.K.

N82-32272# Science Applications, Inc., Canoga Park, Calif. Combustion Science and Advanced Technology Dept.
COMBUSTOR MODELING FOR RAMJET DEVELOPMENT PROGRAMS **c20**
P. T. Harsha, R. B. Edelman, S. N. Schmotolocha, and R. J. Pederson *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 18 p refs (For primary document see N82-32256 22-99)
(Contracts F49620-80-C-0082; F33615-77-C-2062)
Avail: NTIS HC A12/MF A01

The application of a modular model to predict of the performance of sudden expansion burners is described. The model which is based on a concept in which the recirculation zone, treated as a stirred reactor, is coupled to a parabolic boundary layer formulation for the flow outside of recirculation zone. Hydrocarbon oxidation kinetics and turbulent kinetic energy turbulence models are included. The parabolic flow and stirred reactor elements and a module which represents the fuel injection process was developed. Results of the application of the modular model to the analysis of cold flow and reacting flow dump combustor experimental data are described, and the use of the model as an interpretative tool in a recent ramjet combustor development program is outlined. E.A.K.

N82-32273# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
THE MATHEMATICAL MODELLING OF AIR-AUGMENTED ROCKET COMBUSTORS: A PROGRESS REPORT **c20**
J. C. Birchley, L. T. Glasspool, and A. S. Wilson *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 20 p refs (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

The theoretical bases for the calculation of axisymmetric and three dimensional ducted flows are set out and suitable solution procedures are outlined. Results from examples of axisymmetric ducted flow are measured and directions for future work are indicated. E.A.K.

N82-32274# Laval Univ. (Quebec). Dept. of Mechanical Engineering.
COMBUSTOR MODELLING STUDIES FOR RAMJETS **c20**
P. Roy, A. F. Schlader, and J. Odgers *In* AGARD Ramjets and Ramrockets for Mil. Appl. Mar. 1982 10 p refs Sponsored in part by the Canadian Natural Sciences and Engineering Research Council (For primary document see N82-32256 22-99)
Avail: NTIS HC A12/MF A01

Premixed propane air within a baffle stabilized, ceramic lined combustor was used to measure the gas composition at several stations downstream of the recirculation zone. The test rig was operated at atmospheric conditions over a range of equivalence ratios from phi = 0.70 to 1.82. A simple three equation model was developed to describe the composition and temperature profiles. The model was tested for varification by steam injection. The model is found that is satisfactory for all conditions examined. E.A.K.

N82-32275# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE, NO. 17
17 Aug. 1982 110 p refs Transl. into ENGLISH of various Russian articles
(JPRS-81552) Copyright. Avail: Issuing Activity

Highlights from the manned space mission of the Salyut-7 flight are reported. Topics studied include: aerospace sciences, interplanetary sciences, life sciences, aerospace engineering, aerospace applications, and aerospace policy and administration. For individual titles, see N82-32276 through N82-32292.

N82-32276# Joint Publications Research Service, Arlington, Va.
CHRONOLOGY OF SALYUT-7 FLIGHT **c12**
In its USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 1-5 Transl. into ENGLISH of various Russian articles (For primary document see N82-32275 22-99)
Avail: Issuing Activity

Activities on the flight of the Salyut-7 are chronogically reported. The improved autonomous navigation system Del'ta was tested. This system determines automatically the trajectory parameters of the orbital complex and issues commands for performance of necessary dynamic operations. Plant development, orientation, leaf, color and other features were observed. The Del'ta was used to study biological experiments, visual observation of the ocean and physical exercises. The Astra-1 mass spectrometer measures atmospheric parameters in the immediate vicinity of the station and studies Earth's atmosphere and ionosphere. Cardiovascular systems under physical loads were studied. The transfer in orbit of a visiting crew is reported. Medical/biological, technological, astrophysical experiments and Earth atmosphere and photography of Earth surface and oceans were studied. Adaptation of human organisms to weightlessness is also investigated. E.A.K.

N82-32277# Joint Publications Research Service, Arlington, Va.
NEW FEATURES OF SALYUT-7 STATION **c18**
B. Konovalov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 6-8 Transl. into ENGLISH from Izv. (USSR), 18 May 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The interior, and improvements made on the Salyut-7 space station are reviewed. Improvements include: basic technical parameters, improved living and working conditions, extended capabilities of scientific equipment. The planning of technical investigations which are needed for the creation of future equipment which is to be used in space is also discussed. E.A.K.

N82-32278# Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS OF COSMOS SATELLITES **c15**
A. Maksimov and B. Pokrovskiy *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 9-12 Transl. into ENGLISH from Pravda, 23 Mar. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

An overview of the Cosmos satellite experiments over the last two decades is presented. The review includes the following topics: solar activity in the near Earth atmosphere; processes taking place on the Sun as related to the safety of manned flights beyond Earth's atmosphere; the effects of ionospheric disturbances on radio wave propagation; seasonal variations in the ionosphere; extra-atmospheric astronomy; emissions by hot stars and gamma ray bursts; the effect of spaceflight factors on biological objects; development and testing of space technology elements and systems; information on distribution of moisture in the atmosphere and temperatures in world oceans; and investigation of temperature and optical irregularities on water surfaces, along with wave action and storms. E.A.K.

N82-32279# Joint Publications Research Service, Arlington, Va.
FURTHER COMMENTARY ON ACCOMPLISHMENTS OF COSMOS SATELLITES **c15**
V. Lyndin *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 13-16 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 43-44 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The accomplishments of the Cosmos artificial satellites are reviewed. Standardization enabled the use of unified hulls, service systems to control the on board equipment and to change to series production of the satellites and the completing elements. Cosmos satellites are used for the following purposes: space meteorological services; television tracking of clouds; launching of meteorological satellites; ocean studies by space technology; long range space television, telegraph, and telephone communications; study of the Earth's magnetic field; investigation and utilization of natural resources; improvement of safety of marine navigation; aids to manned space flights; and medical and biological experiments. E.A.K.

N82-32280# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON FIRST RESULTS FROM VENERA-13 AND

VENERA-14 **c91**
R. SAgdeyev and V. Moroz *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 25-29 Transl. into ENGLISH from Pravda (USSR), 12 Mar. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

Some of the first impressions from the study of the planets by spacecraft are discussed. The telemetric information which was received was processed. Transmission to Earth of telemetric information about measurements made directly in the atmosphere of another planet are reported. The general rules governing the structure and evolution of the planets are examined. The complexity of the technology of the actual flights to Venus, space communications, flight control and landing control, and the development and production of the automatic interplanetary stations themselves are outlined. E.A.K.

N82-32281# Joint Publications Research Service, Arlington, Va.
VENERA MASS SPECTROMETER DATA ON ATMOSPHERIC COMPOSITION **c91**
V. Istomin *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 30-33 Transl. into ENGLISH from Pravda (USSR), 21 Apr. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The development of mass spectrometers for analyzing the rare gases in the atmosphere of Venus is outlined. American and Russian mass spectrometers flown on the Pioneer Venus and Venera craft and the analytical results obtained from them are compared. Development of the vacuum systems for the mass spectrometers is discussed. The purpose for making determinations of the rare gas content of the Venus atmosphere is described, and some conclusions drawn from this data about planetary evolution are presented. J.D.

N82-32282# Joint Publications Research Service, Arlington, Va.
CYBERNETIC ANALYSIS OF CARDIAC RHYTHM OF SALYUT-6 ORBITAL STATION CREW DURING GRADED EXERCISE TEST **c52**
R. M. Bayevskiy, Zh. V. Varsukova, and I. G. Tazetdinov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 38-44 refs Transl. into ENGLISH from Kardiologiya (USSR), v. 21, no. 11, Nov. 1980 p 100-104 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The use of heart rhythm for evaluation and forecasting of the functional state of the cardiovascular system during astronaut exercise and conditioning is described. Inflight tests with graded exercise on a bicycle ergometer during the first four flights of the Salyut 6 orbital station were performed. Cardiac rhythm was analyzed by the continuously sliding method, where each successive sample included part of the preceding one. Changes in the mean duration of cardiac intervals, the power of the slow waves of cardiac rhythm, and the tension index of regulatory mechanisms calculated from the histogram parameters before and during exercise tests on eight astronauts are evaluated. Changes in regulatory systems associated with the conditions of long term spaceflight are discussed. J.D.

N82-32283# Joint Publications Research Service, Arlington, Va.
COMBINED REHABILITATION AND THERAPEUTIC MEASURES IN SPACE MEDICINE **c52**
T. N. Krupina, A. V. Beregovkin, V. M. Bogolyubov, B. M. Fedorov, A. D. Yegorov, A. Ya. Tizul, V. V. Bogomolov, V. V. Kalinichenko, A. P. Ragulin, and V. A. Stepin *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 45-51 refs Transl. into ENGLISH from Sov. Med. (USSR), no. 12, Dec. 1981 p 3-8 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

A graded 75 day rehabilitation program for astronauts following prolonged space flight is described. The schedule of therapeutic measures employed at different stages of the rehabilitation process is presented and evaluated. The program employed a combination of psychotherapy, physical exercise, hydrotherapy and massage, and physiobalneotherapy. The functional state of the different physiological systems was sucessfully normalized during this regime. J.D.

N82-32284# Joint Publications Research Service, Arlington, Va.
COOPERATIVE EFFORT SUGGESTED FOR RESEARCH ON EXTRATERRESTRIAL LIFE **c55**
Yu. Zaytsev *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 52-54 Transl. into ENGLISH from Leningr. Pravda (USSR), 16 Feb. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

A cooperative international effort to search for living microorganisms on Mars is suggested. The history of speculations on the existence of life on Mars is reviewed. Attempts to determine whether animals and plants can survive in a simulation Martian atmosphere are summarized. J.D.

N82-32285# Joint Publications Research Service, Arlington, Va.
NOTES ON COSMOS AND PROTON LAUNCHERS **c15**
I. Merkulov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 55-57 Transl. into ENGLISH from Krylya Rodiny (USSR), no. 12, Dec. 1981 p 26 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The design, development, and missions of the Cosmos and Proton launch vehicles are summarized. The first stage of the Cosmos contains an RD-214 engine using liquid hydrocarbon fuel with a nitric acid oxidizer, developing a thrust of 74 T, and the second stage employs an RD 119 engine fueled by nonsymmetrical dimethyl hydrozine and oxygen and develops 11 T of thrust. The mission purpose of the intercosmos launch vehicle and Intercosmos orbital stations are surveyed. J.D.

N82-32286# Joint Publications Research Service, Arlington, Va.
LOW-THRUST ENGINES FOR SPACECRAFT **c20**
V. Ivanov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 58-61 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 2, Feb. 1982 p 42-43 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The advantages of low thrust engines for spacecraft are outlined and orbit transfer and interplanetary trajectory strategies are discussed. An Earth-Mars flight is given as an example. Constraining factors effecting the characteristics of an electric propulsion spacecraft such as the carrier vehicle design and electric power source are also addressed. M.G.

N82-32287# Joint Publications Research Service, Arlington, Va.
PROSPECTS FOR POWER ENGINEERING IN SPACE **c44**
V. S. Avduyevskiy, S. D. Grishin, L. V. Leskov, V. K. Ablekov, and A. F. Yevich *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 62-70 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 6, Nov. - Dec. 1981 p 2-6 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

Methods for producing electric power in space, including satellite solar power stations, nuclear breeder reactors, and thermonuclear reactors are examined in terms of estimated costs and power production capabilities. Mass reduction of power stations, the transport of components into space, and the delivery of assemblies into a geosynchronous orbit are discussed. The advantages of using electric rocket engines for interorbital delivery 'tugs' are outlined and the feasibility of using laser engine launch vehicles with Earth based laser energy sources is explored. M.G.

N82-32288# Joint Publications Research Service, Arlington, Va.
SPACE ANTENNAS **c32**
V. Andreyev and V. Shagov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 71-74 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 40-41 (For primary document see N82-32275 22-99)

Avail: Issuing Activity

The design and operation of ground based space communication antennas are generally reviewed. Antenna components, phased arrays, atmospheric attenuation, and characteristic radition patterns are addressed. M.G.

N82-32289# Joint Publications Research Service, Arlington, Va.
SATELLITE SYSTEMS FOR MARINE RESCUE c15
B. Konovalov *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 79-80 Transl. into ENGLISH from Izv. (USSR), 5 Feb. 1982 p 3 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

Existing and proposed maritime communication satellite systems are briefly reviewed. In particular, the INMARSAT system and an international project to develop a search and rescue network are discussed. M.G.

N82-32290# Joint Publications Research Service, Arlington, Va.
MILITARIZATION OF U.S. SPACE PROGRAM ALLEGED c12
A. Timofeyev *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 91-93 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 42-43 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The alleged increase of militarization in the United States space program is addressed. Specific reference is made to the dominance of the space shuttle operational program by the Department of Defense and the cutbacks in funding for NASA scientific programs. Military considerations for the development of space bases, antisatellite weapons, and antimissile systems are also cited. The Soviet Union's proposal to the United Nations' General Assembly for a treaty prohibiting weapons of any kind in space is also discussed. M.G.

N82-32291# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON U.S. SPACE POLICY AND PROGRAMS c12
I. I. Isachenko *In its* USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 94-103 Transl. into ENGLISH from Ekon. i Organ. Prom. Proizv. (USSR), no. 1, Jan. 1981 p 171-186 (For primary document see N82-32275 22-99)
Avail: Issuing Activity

The research and contract policy of the National Aeronautics and Space Administration is analyzed. Several stages of research are described, from preliminary project assessments to detailed definition and production. The coordination and monitoring of contractors and subcontractors is addressed with reference to the space shuttle and Apollo programs. Finally, technology transfer practices are discussed. M.G.

N82-32292# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES c15
In its USSR Rept.: Space, No. 17 (JPRS-81552) 17 Aug. 1982 p 104-105 Transl. into ENGLISH from various Russian articles (For primary document see N82-32275 22-99)
Avail: Issuing Activity

Cosmos satellites launched between June 10 and July 21, 1982 are listed with statements of satellite mission and orbital parameters. In addition, information on the Molniya-1 satellite is given. M.G.

N82-32293# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY, NO. 99
9 Apr. 1982 55 p Transl. into ENGLISH from various West European articles
(JPRS-80536) Avail: NTIS HC A04

New articles announcing recent European technological developments are presented. For individual titles, see N82-32294 through N82-32300.

N82-32294# Joint Publications Research Service, Arlington, Va.
PLAN FOR EXTENSIVE ENERGY PROJECT WITH FORTY WINDMILLS c44
In its West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 15-16 Transl. into ENGLISH from NRC Handelsblad (Netherlands), 1 Mar. 1982 p 3 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

Dutch electricity production companies have highly advanced plans for an extensive wind energy project. They call for a 'park' of thirty to forty middle sized windmills which would have to produce a total of 10,000 kilowatts of electricity. Author

N82-32295# Joint Publications Research Service, Arlington, Va.
DANISH-SWEDISH WINDPOWER COMPANY FOUNDED IN DENMARK c44
Mikael Holmstrom *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 17-18 Transl. into ENGLISH fom Y Tek. (Sweden), 4 Feb. 1982 p 3 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

The Swedish General Electric Co. (ASEA) has founded a windpower company in cooperation with the Danish state and a Danish company. They expect to build 250 windpower plants through 1984. If a Swedish market opens a similar partner company is planned in Sweden. Author

N82-32296# Joint Publications Research Service, Arlington, Va.
BELGIUM, FRG UNDERGROUND COAL GASIFICATION PROJECT c44
Lode Willems *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 19-22 Transl. into ENGLISH from Kneck (Belgium), 24 Feb. 1982 p 58-59 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

Plans for the underground coal gasification of one to five K deep coal reserves are described. The European energy market is surveyed. Retrocombustion with a mixture of pure oxygen and high pressure steam at a depth of 860 m is under investigation. J.D.

N82-32297# Joint Publications Research Service, Arlington, Va.
FRANCE TO TRY FUEL OIL COAL MIXTURE AS SUBSTITUTE FUEL c28
In its West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 23-24 Transl. into ENGLISH from Le Nouvel Econ. (France), 15 Feb. 1982 p 55 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

Plans for a pilot plant for the production of 8 TPD of an equal part mixture of fuel oil containing suspended coal particles of 40 to 50 microns diameter are announced. The fuel is intended for use by small and medium size enterprises. Development of a stable mixture having flow and combustion properties similar to those of fuel oil is sought. J.D.

N82-32298# Joint Publications Research Service, Arlington, Va.
OPTICAL FIBER MULTIPLE SENSOR FOR GRIPPING COMPLEX OBJECTS c54
Michel Defaux *In its* West Europe Rept.: Sci. and Technol., No. 99 (JRPS-80536) 9 Apr. 1982 p 30-31 Transl. into ENGLISH from L'Usine Nouvelle (France), 11 Feb. 1982 p 48-49 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

The development of an experimental grip for industrial robots which provides a sense of touch is announced. Multiple fiber optic sensors (Stafo) are integrated into the structure of the three fingers of the grip. Grasping tests on simple and complex geometrical shapes, and on deformable and fragile objects, incuding eggs, were performed. The grip was designed for use in the assembly of small parts (1 cu decimeter and 1 kg) such as are used in household appliances. J.D.

N82-32299# Joint Publications Research Service, Arlington, Va.
SWEDISH HIGH STRENGTH POLYETHYLENE FIBES DEVELOPED c27

In its West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 p 32-33 Transl. into ENGLISH from NY Tek. (Sweden), 28 Jan. 1982 p 46 (For primary document see N82-32293 22-99)
Avail: NTIS HC A04

The development of polyethylene fiber reinforced polyethylene is described. High strength polyethylene fibers are produced by cold stretching, solid phase extrusion, and spinning to stretch the molecular arrangement of high density polyethylene. The resulting high strength fibers are rolled onto low density polyethylene film which is melted to ensure adhesion of the fibers. The polyethylene fiber reinforced polyethylene film is then baked into larger sheets. Applications for the light weight, strong, rigid composite are in communications and as a competitor for more expensive fibers used in aircraft and automobile construction. J.D.

N82-32300# Joint Publications Research Service, Arlington, Va.
AIRBUS A 310 WILL COMPETE WITH BOEING 767 FOR MARKET **c03**
Pierre Kerlouegan *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 44-47 Transl. into ENGLISH from Le Figaro (France), 17 Feb. 1982 p 9 (For primary document see N82-32293 22-99)
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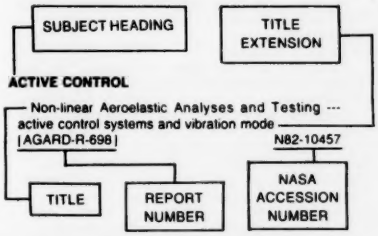
The European A-310 airbus is described, compared with the Boeing 767, and an analysis of its market presented. The A-310 is certified to fly with a crew of two. Projections for the larger A-320 are given. The basic configuration of the A-310 is presented. J.D.

Typical Subject Index Listing



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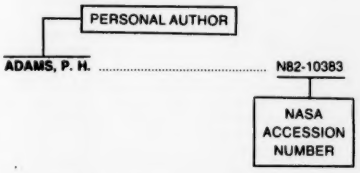

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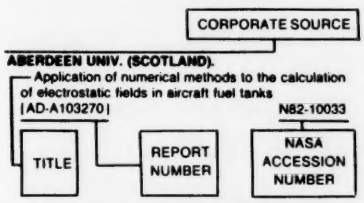

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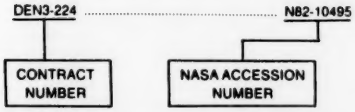

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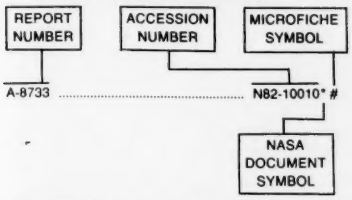

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